



OER4Schools: Outcomes of a Sustained Professional Development Intervention in Sub-Saharan Africa

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Sustaining educational initiatives beyond short-term pilot projects is highly challenging in low-income countries. We describe the outcomes and implications of our iterative Design-Based Implementation Research conducted in Zambia. This focused on a unique, school-based, peer-facilitated professional learning programme for primary teachers: OER4Schools integrates interactive pedagogy, open digital educational resources and mobile learning. Teacher interviews carried out 18 months after a year-long intervention showed that the programme became self-sustaining; earlier participants reported further development of their interactive teaching strategies and awareness of pupil progress; recent joiners developed similarly. Roles of teachers and pupils changed and a new classroom culture emerged. The study identifies the key mechanisms involved in sustainability, including culturally sensitive and participatory development and implementation, semi-structured multimedia materials, and supportive organisational structures for sustained professional learning. Our findings are hence framed by sociocultural influences as well as the wider policy context.

Keywords: teacher professional development, Zambia, school leadership, sustainability, Sustainable Development Goal (SDG) 4, design-based implementation research, learner-centred pedagogy, Culturally Responsive Pedagogy (CRP)

INTRODUCTION

Our research responds to the 4th Sustainable Development Goal (SDG4) on inclusive, quality Education for All and the particular need to increase the quality of teaching and learning in primary education: 250 million children in schools are not acquiring basic literacy and numeracy skills (UNESCO, 2014, 2015). While the need is recognised, there is little consensus on what quality means. Prevailing views focus on achievement in exams, with a conspicuous lack of focus on process, including a general absence of discourse around pedagogy and the process of classroom teaching (Schweisfurth, 2015). Our notion of quality is informed by the wider social justice perspective (Tikly and Barrett, 2011; p. 18), encompassing learner participation, capability and inclusion—the opportunity to achieve—and the personal and cultural relevance of learning outcomes.

Teacher professional development (TPD) is important for raising quality, and there are many TPD initiatives in Sub-Saharan Africa (SSA). Globally, however, there is little evidence concerning which specific elements of TPD are effective for student attainment (Sims and Fletcher-Wood, 2018), and moreover, examining the sustainable impact of TPD on teaching practice is rare (SSA: Haßler et al., 2018). We do know that TPD is not always successful. For example, in UK TPD

programmes promoting dialogic approaches that support joint knowledge building (Alexander, 2008; Littleton and Mercer, 2013), interventions have varied markedly in their impact (for an overview, see Hennessy and Davies, 2019) and the long-term impact of TPD on the quality of classroom dialogue has rarely been investigated. The long-term impact is even more problematic in – often very challenging – low-income country contexts, where “Northern” approaches are sometimes parachuted in and are even less likely to persist. Therefore, in light of SDG4, it seems to be of the utmost importance to consider the effectiveness of TPD, not just on teacher and student outcomes, but also to consider whether those pedagogical improvements are sustained.

Our previous research (Haßler et al., 2014; Hennessy et al., 2015, 2016) investigated what kinds of in-service TPD are suitable for supporting pedagogic innovation in SSA, with and without the use of new technologies. It confirmed that effective TPD is school-based and peer-facilitated, focuses on classroom implementation, creates opportunities for collaboration with colleagues, and draws on digital technology where available in classrooms – as a motivator for professional learning and pedagogic change (resonating with Moon et al., 2013).

In this paper, we ask whether and how a holistic approach to TPD addressing the above quality criteria for student learning can be sustained in a low-income country setting. We report on a follow-up study to our iterative development and refinement of OER4Schools¹, an open, school-based multimedia TPD programme integrating interactive pedagogy, open (digital) educational resources and use of mobile devices where available. OER4Schools offers scaffolded, dialogic, teacher-led professional development which is designed – and contextually appropriate for – SSA. Although formulated independently, OER4Schools resonates with, and offers a concrete implementation of, the effective learning-centred education described by relatively recent research syntheses (Westbrook et al., 2013; Nag et al., 2014; Schweisfurth, 2015); this work converges on the conclusion that interactive pedagogical practices support student learning. Schweisfurth outlines the central mechanisms of effective pedagogy as learner motivation, cognitive engagement, respectful classroom relationships, building on prior knowledge and understanding, dialogic pedagogy, a curriculum relevant to learners’ lives, outcomes comprising skills, knowledge and attitudes, and formative assessment. The systematic review by Westbrook et al. (2013, p. 37) considered which pedagogic practices most effectively support all students to learn (at primary and secondary levels in low-income countries), concluding that it is “when teachers see pedagogy as a kind of communication with students that their teaching practices become meaningful, leading to positive outcomes for their students”. The authors emphasise interactive approaches: that is, giving feedback; creating safe environments; demonstration and explanation drawing on sound pedagogical content knowledge; flexible use of whole-class, group and pair work where students discuss a shared task; open and closed questioning; varying lesson sequences. The value of such approaches is also recognised in other contexts; for example,

two recent large-scale studies in English primary schools have shown that classroom dialogue is productive for student learning, as measured on standardised tests, and improves attitudes to school (Alexander, 2018; Howe et al., 2019). The evidence for cognitive benefits of group work is also very strong (e.g., Howe and Mercer, 2007).

The OER4Schools programme consists of 28 structured 2-h workshop sessions covering questioning, whole-class dialogue, group work, inquiry-based learning, and Assessment for Learning; it has – optional – technology use infused throughout. Reflective dialogue through video-stimulated discussion with peers, post-lesson review and concrete planning, explicitly encourages a cycle of reflective practice and critical inquiry and supports ongoing deep change. **Figure 1** illustrates one such model, depicting workshops involving shared reflection, input and shared planning, followed by trial teaching in each case. A unique feature is built-in ‘educator notes’ offering guidance to facilitators (cf. **Figure 2**). Importantly, OER4Schools is not a monolithic ‘one size fits all solution’. It emphasises an approach to TPD and classroom practices that is likely to be effective, but within a framework that allows adaptation and sharing. While the programme was initially contextualised for Zambia, OER4Schools has wide relevance for educators, resource designers, policymakers, and researchers working in other low-income contexts, and it has been adapted for other countries in SSA.

We argue that iterative and participatory approaches to programme development are important factors for quality, scalability and sustainability (Akyeampong et al., 2011; Tikly, 2011). While such approaches are certainly not unique in international development, and other examples can be found (e.g., RTI International, 2014), the OER4Schools approach is unusual in that it provides particularly extensive opportunities for teacher involvement in not just reviewing quality-assured materials, but actually co-creating them (over extended periods of time), as well as in contributing to research. Moreover, the process did not just focus on classroom materials, but teacher input was sought at the TPD level.

The success of the approach was previously investigated through a 1-year field trial of OER4Schools in a low-resourced primary school (‘Phase 3’, Hennessy et al., 2016); the programme ran weekly with 12 teachers including a peer facilitator. The findings offered evidence for changes in thinking and practice, and that this model can help to build teacher capacity and increase achievement and participation of all pupils.

Research Questions

In this paper, we examine how sustained these earlier changes were when the programme subsequently ran bi-weekly for 2 years (‘Phase 4’). We draw on interviews carried out 18 months into this phase of the intervention, involving the original teachers plus 24 new participants in the programme.

The research questions addressed in this paper are:

1. Did teachers continue to develop their practices and did change already documented during an earlier trial persist? If so, what changes persisted?

¹www.oer4schools.org

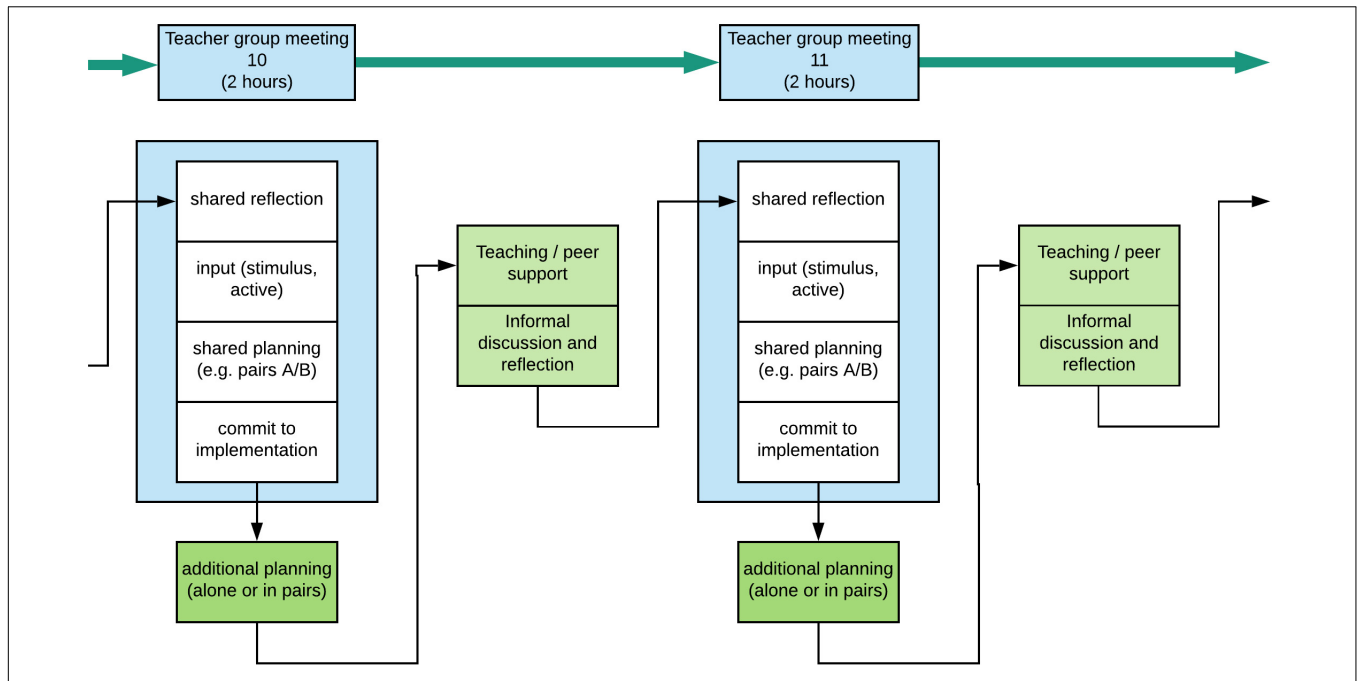


FIGURE 1 | An iterative sequence of workshops and trialling of teaching approaches.

It will be useful for the questions to be written out on the board so that everyone can see how the questions evolve (and to see the 'size' of each question) as each person poses a question.

Educator note

Highlight to the teachers that such a process of posing, refining and sizing of questions is by itself a useful enquiry activity for students. We are inviting them to pose questions and think about what kind of investigation needs to take place to respond to the questions. It may be the case that some questions seem rather 'straightforward' so posing further probing questions like 'how do you know' or 'why do you think so' will be helpful to further deepen the thinking process of the students.

5.2.5 Posing real and productive questions - video watching

Observing, thinking, reflecting (10 min) on *posing real and productive questions* Watch the following clip on Abel trying to get students to understand the relationship of area and perimeter. Pay attention to the questions he posed:

- What other questions could be asked to elicit the students' ideas on the concept of area?
- How might a 'think pair share' approach to the class discussion have affected students' learning?
- Consider the question, 'How do/can we measure area?'. How might this question be developed into a useful enquiry activity for students?



Whole class discussion on the meaning of area

FIGURE 2 | An extract from the OER4Schools resource, showing an educator note.

2. What, if any, changes in pedagogical practices considered conducive to improving pupil learning were reportedly taking place among a new cohort of teachers who were not part of the original trial?
3. What are the lessons that might be learned regarding wider influences on participation and engagement of stakeholders, and cultural appropriateness of TPD for learner-centred education (LCE) in the SSA context? What further mechanisms might strengthen the approach?

The findings offer evidence for the sustainable outcomes of this and similar TPD models and their viability within the SSA context. The impact is arguably often ephemeral or not charted over the long term. This article shows, however, that in this case the impact constituted sustained pedagogic change to an extent as confirmed by the continuation and consolidation of new approaches. It also shows that a degree of widening of the programme was possible within the institution, with minimal external support.

CONCEPTUAL FRAMEWORK

In light of the discourse around the meaning and appropriateness of learner-centred education, we begin by outlining how we frame our programme design and research in terms of sociocultural influences and cultural sensitivity. We then present an overview of the methodology underlying the research and development work. We detail the changes observed and sustained in teachers' thinking and practice and reflect on the mechanisms involved, and outline how our findings relate to wider influences (such as policy), affecting the programme. Leadership remains an active topic of research. For example, Postholm (2020) concludes that leadership in schools is "the main factor that can impede or enhance expansive learning and thus institutional development" (p. 1). Our final conclusions are presented through the lenses of Leadership for Learning (LfL: Frost, 2014; also used in Ghana²), to identify the strengths and weaknesses of our approach.

Cultural Appropriateness of Learner-Centred Pedagogy

A key principle underlying programme design for local ownership and sustainability is for it to be culturally appropriate, tailored to local needs and open to participant-led amendments. We believe that TPD should empower teachers to make informed choices appropriate for their learners and settings, while at the same time sharing knowledge and established practices from other contexts, exposing teachers to new ideas and providing them with an opportunity of seeing what they feel comfortable with. The TPD is thus participant-centred and seeks to implement learner-centred education in the classroom.

Cultural sensitivity has been a challenge to TPD programmes implemented in low-income settings (Schweisfurth, 2011). Critics have pointed out the naivety/inappropriateness of attempting simply to import foreign notions of LCE. Problems

have resulted from a failure to sufficiently take into account local culture, local initiatives and policy frameworks, including conditions for participant buy-in. Schweisfurth (2011, p. 429) asks whether LCE shapes cultural attitudes, or needs to reflect cultural changes already taking hold. In our own experience, these two possibilities are interrelated. Our position falls in the middle of the spectrum between those who "package learner-centred approaches as though they look the same everywhere [and] can be imported wholesale from one context to another" (Schweisfurth, 2015, p. 261), and those who argue that entirely locally driven, bottom-up approaches are essential. The latter notion is complex, since the embedded effects of colonialism and participants' prior experiences make it hard to determine "truly local" forms of pedagogy (Tabulawa, 1997). Other contextual factors further influence the appeal, shape and implementation of LCE at multiple scales, ranging from community to districts and regions.

Interactive pedagogy – including teaching of higher-order thinking skills – is, in fact, government policy in many countries in SSA; it is taught at teacher colleges and occasionally through professional development initiatives, and increasingly integrated into primary level curricula (Buckler and Gafar, 2013, p. 121). Many of the concepts underlying OER4Schools are thus not radically new to teachers – especially qualified teachers. However, Schweisfurth (2011) review of 72 articles highlighted significant implementation gaps for LCE in both schools and teacher education in low-income countries, due partly to the impact of the cultural context, including the substantial shifts required in hierarchical relationships and roles of teachers and learners. Moreover, college teaching itself does not model interactive approaches and (student) teachers themselves consequently have little voice in their own learning. Interactive approaches are not experienced during teaching practice either, nor are they prevalent in schools. Newly qualified teachers tend to adopt the familiar, traditional methods of their own schooling and of their colleagues and local mentors (UNESCO, 2014). Additionally, inspection regimes and the demands of centralised curricula and assessment may discourage or erode interactive approaches (Schweisfurth, 2011) or be perceived by teachers to do so (Hennessy et al., 2015).

Nevertheless, many teachers are aware of interactive approaches and of their official endorsement nationally. To bridge the implementation gap, OER4Schools sought to capitalise on this, offering practical, effective, locally contextualised and sustainable means of implementation, rather than "bland statements of 'what works'" (Schweisfurth, 2011, p. 430). Importantly, the programme was consciously designed – and found – to support teachers in addressing some of the challenges they see themselves as facing. This is important for the take-up of new practices; our research indicates that these challenges include low attaining pupils, lack of learner engagement, pupils' limited English language skills, and lack of parental involvement (Hennessy et al., 2015, 2016).

To address those challenges our design and implementation of OER4Schools drew on many of the underpinning principles of Culturally Responsive Pedagogy, "a process of learning that incorporates and emphasises the use of cultural knowledge,

²<https://www.educ.cam.ac.uk/centres/real/researchthemes/leadership/leadershipforlearning/>

cultural heritage and cultural performance styles; aiming to make learning more effective and appropriate for both pupil and teacher” (Gay, 2010, p. 23). Our analysis pays particular attention to the five themes emerging from a synthesis of research by Brown-Jeffy and Cooper (2011), and recently framing a critical analysis of the cultural appropriateness of the One-Laptop-Per-Child programme in Rwanda by Girgis (2015): identity and ownership; equity and excellence (denoting incorporation of locally appropriate and generated content); developmental appropriateness; teaching the whole child; and student–teacher relationships.

In our original study, some teachers were initially reluctant to confront cultural norms, for example when they encountered the key Assessment for Learning principle of sharing learning objectives with their classes (Hennessy et al., 2015). However, other teachers embraced change, perhaps partially because such approaches are found outside school, such as discussion during Bible study. Overall, the teachers were generally open-minded and receptive to new ideas, especially because stimuli (including video) were derived from the Zambian context. The vast array of resources on offer, the semi-structured nature of the OER4Schools sessions, and built-in reflection upon both existing and new practices supported change. These features enabled teachers to engage in lively workshop debate about new approaches and to devise their own lesson activities around these. Local facilitators adapted the material before or during sessions to suit their contexts and constraints. Local contextualisation and ownership necessitated taking into account existing ‘learner-centred’ practices (e.g., Sriprakash, 2010); teachers were encouraged to share their own interactive strategies with peers. Along with long-term iterative development of the programme (as outlined below), these strategies successfully served to maximise teacher ownership, leadership and hence sustainability. Spontaneous rollout within the school in Phase 4 – the subject of this paper – confirmed that teachers and school leaders perceived both benefits and ownership of the programme.

Policy Frameworks for Supporting TPD: The SPRINT Programme and Teacher Incentives

Sustainability depends on a larger, supportive infrastructure extending across all stakeholders in an educational setting (Suurtamm and Vézina, 2010). Initiatives must not only build community among fellow teachers for everyday support but must also gain the vital endorsement of the headteacher as the visionary for school policies and procedures. Other stakeholders with strong influences on pedagogical practice include regional government, national ministries of education and their inspectors. Teacher engagement and local decisions should thus be framed by overall policy, recognising that it may support or constrain effective TPD and participation of teachers and learners, alongside wider sociocultural factors. Schweisfurth (2011) points out that policy on LCE rarely reflects “joined-up thinking which takes into consideration all parts of the education system” (p. 429), especially inspection and examination regimes.

In the case of Zambia, the need for sustainable, cost-effective programmes offering large numbers of teachers opportunities for learning, and programmes which include not only subject content but also methodologies, led to the conception of the so-called “School Program of In-service Training for the Term” (SPRINT) in 1996 (Mubanga, 2012). Regular teacher group meetings (so-called ‘TGMs’) were scheduled outside lesson time but within the working day. Take-up and implementation was initially patchy and hampered by: negative attitudes of some teachers, school leaders and coordinators; lack of organisational and facilitation skills among school in-service coordinators; inadequate equipment and educational materials at teacher resource centres; demand for financial incentives (Mwale, 2006; Mazala, 2009; Mwansa, 2010). However, a ring-fenced space potentially usable for TPD is a significant advantage, and at the Chalimbana Primary School³ where our main study was conducted, the use of timetabled SPRINT meetings for a pedagogy-focused programme was negotiated with the headteacher. The scaffolding built into OER4Schools helped to overcome some of the challenges, such as lack of facilitation skills.

Iterative and Participatory Programme Development and Trialling

Our approach shares features with the Design-Based Implementation Research approach, which emphasises the following: a focus on persistent problems of practice as constructed by multiple stakeholders; commitment to iterative, collaborative design; developing theory and knowledge related to both classroom learning and implementation; and developing capacity for sustaining change in systems (Penuel et al., 2013). OER4Schools was initiated in response to a Zambian NGO, iSchool.zm, which integrated technology into schools with limited pedagogical support at the time; it was partially co-developed and culturally contextualised by Zambian teachers and other local partners. This resonates with the observation by Mubanga (2012) that knowledge needs to be actively acquired by participants, importance needs to be placed on local values and expertise, and existing capabilities need to be drawn upon. Moreover, responding to teacher and learner needs again helps to secure ownership and relevance, and sustain programmes.

To help us achieve these objectives, we drew on the Leadership for Learning approach (Frost, 2014), the central premise of which is that leadership can be exercised by anyone regardless of status, and that everyone should be learning in the widest possible sense. The key ideas within LfL are encapsulated in a set of five principles for practice: focus on learning; conditions for learning; learning dialogue; shared responsibility and shared accountability. We drew on these principles during the development of our programme as a way of making practice explicit, and additionally introduced them to participants in programme sessions, as well as in workshops for headteachers. LfL served as an organisational principle, for example creating conducive conditions for learning during workshops, as well as prompts for reflection. Teacher leadership is not only a pivotal concept for the LfL approach, but also a key component of

³Formerly: Chalimbana Basic School

effective contemporary TPD, featuring distributed leadership, ongoing classroom trialling, and sufficient scaffolding sustained over time (Orr et al., 2013; Westbrook et al., 2013, pp. 60–64).

A common threat to sustainability is creating dependence on impermanent external agents for new ideas or resources, encouragement, or evaluation; this has been documented by Butler et al. (2004) and others, and it presents a potential barrier to sustaining interactive teaching communities in the long term. Withdrawing support at the end of a pilot project runs the risk that “new barriers may emerge in the long run or the impact of interventions or reform may not be sustainable after funding is withdrawn” (Westbrook et al., 2013, p. 65). The OER4Schools approach mitigates these risks through its participatory approach – “productive, mutual adaptation” (Penuel et al., 2013, p. 334) – and gradual fading of support: our Phase 4 research investigated whether this was successful. We were particularly interested to see how sustainable the programme might be, running over at least a further whole school year with only peer support – i.e., without support from the research team – and what factors were central.

We deliberately chose to develop the OER4Schools resource over 3 years, so as to enable iterative trialling, input from participants and cultural responsiveness. Feedback was additionally sought from various stakeholders at our teacher workshops, including teacher college lecturers, NGOs and the South African Institute of Distance Education/OER Africa. Teachers provided input on previous practices, including use of mini-blackboards. The practice of pupils coming to the board to give short (‘closed’) demonstrations was extended to group presentations on outcomes from open-ended collaborative work and inquiry-based activities. During the course of the research, government policy shifted from ‘ability’ grouping toward requiring mixed-attainment grouping; OER4Schools provided a supporting framework for implementing this locally prescribed change.

Particularly where the overall experience of TPD design is low, ongoing, extensive, iterative and participatory revision is just as important as an initial participatory design phase. As experience grows, participants can make more detailed contributions to programme design and development. Indeed, the involvement of facilitators in writing the material gradually increased throughout the programme: indigenous stakeholders thereby contributed to the production of appropriate content (Culturally Responsive Pedagogy: Brown-Jeffy and Cooper, 2011). The unit on inquiry-based learning, in particular, benefited from significant input and contained several activities devised by teachers, e.g., investigating indigenous trees and vegetables, along with reasons for growing them (nutritional, economic, ecological, personal considerations), and investigation of water retention in different types of local soil, ultimately “legitimizing their knowledge” (Nolen et al., 2015) through our collaborative process.

Finally, we sought to offer a construction of LCE which does not demand high levels of teaching resources (Schweisfurth, 2015, p. 263) or expenditure and we continually sought input from teachers as to what was actually available locally. We developed a series of exemplar inquiry activities requiring little or no travel beyond the school grounds and minimal resourcing, including, for instance, using plastic water bottles and straws to measure

lung capacity. We then expected participants to devise and adapt their own lesson and fieldwork activities to their local contexts and curriculum.

SUMMARY OF RESEARCH AND DEVELOPMENT PHASES 1–3

Previous empirical work was carried out in three phases. A summary is offered below in order to illustrate iterative programme development and research and, in particular, to set the scene for the findings of Phase 4 presented in this paper. Methods in Phases 1–3 included lesson observation (field notes, photographs, video recordings); evaluation of artefacts (lesson plans, teacher portfolios); post-lesson surveys (written/electronic survey forms); post-lesson meetings (transcripts); semi-structured individual and group interviews with teachers and senior leadership (transcripts); focus groups, analysis of reflective audio diaries, workshop recordings; and feedback on workshops provided by facilitators.

The pilot Phase 1 (January–June 2010) assessed the feasibility of supporting interactive forms of subject teaching using OER in computer- and Internet-equipped primary schools in Zambia (Haßler et al., 2011; Hennessy et al., 2012). We worked with eight experienced teachers in three primary schools in Lusaka province, all serving underprivileged communities. Workshops introduced teachers to the notion of interactive teaching and learning, to technology and digital resources, and to the research methodology. School visits supported the teachers through developing lesson plans, observing and feeding back on lessons. Teachers reported back by emailing us post-lesson surveys. The pilot provoked changes in pedagogical thinking and practices and an enthusiastic response from participating teachers, schools, iSchool and the Ministry of Education. Thus, Phase 2 was conceived. Two teachers co-presented the findings with us at the 2010 eLearning Africa Conference, relaying the stories of their experiences in getting to grips with the new approach and resources.

Phase 2 (October 2010–October 2011) involved four teachers from two of the original schools. The first stage involved supporting them in developing interactive pedagogy through remote communication. The second stage comprised 2 weeks of intensive fieldwork – observing and video-recording lessons, conducting interviews, joint post-lesson reviews, and lesson planning. Lesson reviews entailed extended conversations with the teachers outside lesson time, collectively reflecting on the relative successes and difficulties of teaching the lesson, including technology use. One objective was to capture effective strategies and generalise them for future lessons, paying attention to curriculum and the technologies available in each school context. A joint workshop was held for the two schools to strengthen our support network and offer an opportunity to discuss experiences of interactive teaching, common challenges and new strategies.

Subsequently, we worked with a professional film producer to record six lessons. There was a 3-month period of remote communication beforehand, followed by in-depth, joint lesson planning and review immediately before and after the filmed lessons. Lesson video clips fed into our evolving

multimedia, professional learning programme, described below (Haßler et al., 2014).

In Phase 3 (school year 2012), the programme involved intensive work in one of the original schools: Chalimbana Primary School (Chongwe, Zambia; 50 km East from Lusaka) is a mixed-sex government primary school with around 35 teachers and 1,000 pupils (Grades 1–9). It is poorly resourced and serves a predominantly disadvantaged, semi-rural community; many children are orphaned or otherwise vulnerable. Teachers do not necessarily all speak the languages spoken by children in their classes.

Two teachers moved forward into this third phase, and acted as facilitators for a group comprising all 12 Grades with 4–6 teachers. The OER4Schools collaborative resource development continued in parallel with the trial. Facilitators reviewed and provided feedback on new materials, as well as lessons learned from the earlier parts feeding into the development of later parts, leading to a complete draft version by October 2012. Input from participants was facilitated through regular research visits made to Zambia by our team during the year, and during regular (weekly) calls with facilitators. Our ongoing programme revisions derived from workshop recordings and from teachers' audio diaries, containing guided reflections on the positive or negative aspects of the experience of trialling new teaching techniques and technologies – for teacher and pupils – and what might be done differently next time. A strength of the diary method was the more 'active participation' of research respondents (Holstein and Gubrium, 1995) whereby individuals offered constructions of personal experiences and insights they perceived to be important, with less evident shaping of those constructions through interaction with peers or researchers (Holly, 1987).

Input to the programme development was channelled mainly via peer facilitators, through our regular discussions (with some direct authoring/commenting); the difficulties of remote communication inhibited systematic direct input from all participants. However, feedback was solicited more widely via workshops we facilitated and research interviews involving all participating teachers, facilitators and the headteacher. Phase 3 is described in more detail in two previous articles reporting on the supporting and constraining factors influencing professional learning in this context, (Hennessy et al., 2015) and on the observed impacts of participation in such learning on teachers' thinking and classroom practices (Hennessy et al., 2016).

RESEARCH METHODOLOGY: PHASE 4

Most of the data in this paper derive from Phase 4 (2013/14). In this phase, OER4Schools was spontaneously launched by Chalimbana Primary School as a whole-school programme in January 2013, based entirely on perceptions by participating teachers during 2012 of its successful impact on pedagogy, and its potential for raising school leavers' low attainment in English language and other core subjects. The school-led rollout involved 35 teachers across Grades 1–9. The school decided to move to bi-weekly teacher group meetings, to reduce the

load on teachers, so the 2-year programme continued until the end of 2014; peer facilitators again led colleagues through 2-h-long sessions. The resource was further revised in response to teacher feedback through occasional remote communication. As this Phase 4 originated spontaneously, research funding had been exhausted, thus the scope of the research was limited to follow-up interviews toward the end of this phase. While lack of resources precluded classroom observations, validation of the teacher accounts was systematically sought through multiple methods. Participants presented their learning journals, lesson plans and examples of student work which were examined for evidence. The facilitators who had observed the teachers and their lesson planning corroborated the teacher accounts.

The research focus in Phase 4 was on changes in pedagogical practices considered conducive to improving pupil learning. Data presented in this paper were derived from transcripts of eight semi-structured group interviews⁴ involving all participants physically available at the time ($n = 26$), carried out in June–July 2014 by the lead author. To avoid bias, especially considering that telecommunication is difficult, we went to great lengths to ensure all willing teachers could participate, including scheduling additional interview slots. The eight groups of interviewees included various teachers involved with OER4Schools over the preceding 2.5 school years (3 teachers; 1 interview)⁵, over 1.5 years (13 teachers; 4 interviews), and those who had recently joined the school (5 teachers with 5–6 months experience; 1 interview); workshop facilitators (4: two continuing from 2012, two coming on board for 2013–14; 1 interview); and the school's headteacher (1 interview). The groups were formed based on the duration and type of teacher participation and interview questions were tailored accordingly⁶.

The interviews focused on: participants' experiences and perceived outcomes, particularly with regard to extending the programme to the whole school; levels of continuing participation; teacher learning and change; perceptions of the role of the teacher and capabilities of pupils; perceived impact on pupils; views about the structure of the programme and workshops and discussion opportunities; challenges experienced; levels of technology use; and participant recommendations. In all cases, concrete examples were requested and probed in order to distinguish between aspirations and actual change. To maximise the population validity of the teachers' accounts, development of the interview schedule drew on the analysis of challenges and disagreements in the earlier data. Where our previous research in the setting had identified challenges in implementation or aspects of the programme that the teachers had not agreed with, the interviewees in 2014 were told of these challenges encountered by their colleagues, to legitimise the sharing of negative views and thereby lessen the social desirability bias toward only positive responses. For example, "Some teachers said all pupils were keen to contribute while others said that many were shy and didn't want to talk. What's your experience?"

⁴Group interviews, rather than focus groups.

⁵Note the group of 2012 teachers interviewed in 2014 is small, partially because of teachers leaving the school, but also because two became facilitators.

⁶The interview schedule is available at <https://doi.org/10.5281/zenodo.3604743>

Participants were explicitly encouraged to describe challenges encountered, mitigating a cultural reluctance to share negative perceptions and experiences. Most of the participants were known by the interviewer, and there was a longstanding mutual trust, helping to elicit diverse views. Our earlier interviews from the setting (reported in Hennessy et al., 2015, 2016) demonstrate that the teachers felt confident to share negative views and experiences of challenges.

In order to provide an independent lens, the analysis of audio transcripts was conducted by an independent researcher (the third author) who had not been involved in the design or data collection, other than the design of these interviews. It was guided by the principles outlined here. Initially, cross-sectional indexing (Mason, 2002) was conducted to identify repeated themes and emerging puzzles across the data set. Particular attention was paid to examining the relationships between those themes (Creswell, 2013), as well as discrepancies and counterexamples within and between participants' accounts (Glaser and Strauss, 1967; Silverman, 2015) to ensure categories created were consistent with the whole body of data. NVivo10 software was used to assist coding and to run further reliability checks through text and coding queries, as well as returning to a subset of data to code it again to check the consistency. To ensure the validity of our categories and interpretations, the analysis took care to test the groundedness (*ibid.*) or "empirical anchorage" (Larsson, 1998) of the categories by systematically examining the spread of the discussions across the participants and data sources, and the validity of participants' accounts by comparing their statements to the concrete examples of practice they had provided (Hennessy et al., 2016).

A first round of codes was created through a careful reading of the data set, particularly focusing on talk about the programme, pupils, the teachers themselves, teaching and learning, ICT and teacher collaboration. This first reading gave specific emphasis to both talk about changes and talk about challenges and critiques. This round included codes for change talk, challenge talk and support talk; codes for different types of impact (pupil learning, engagement, other); talk about pupils (capabilities, participation, backgrounds); codes for teacher perceptions, teacher collaboration, teacher professional development, teacher understanding of the programme; code for ICT and resources, as well as school and national issues. The coding was reviewed and discussed by the research team (the authors of this paper). Further codes were developed and the data coded to examine further issues arising. The second round of codes included a focus on the programme materials for educators, workshops and facilitation; school leadership; funding and certification; the specifics of teacher collaboration and community, and sustainability and scalability. Once the data had been coded into these categories, the data within each were examined and systematically compared to see what claims the teachers made with regard to each topic and what evidence they provided to support their claims. After each round of analysis, the coding and tentative findings were discussed collaboratively by the research team, whereby the whole team reviewed initial findings and arguments and the data supporting them. If one of the team members felt that a claim was unsupported by the data

examples, the data were revisited for further evidence and the claim amended or removed.

As ideas were refined during this process, we regularly returned to the original data to test for further occurrences and counter-occurrences in the data. Though not formally part of the study, we conducted selected follow-up telephone interviews in November 2015 (1 year after the conclusion of Phase 4), to gather impressions of whether and how the programme continued. We selected the lead facilitator (still at the school), as well as two teachers who had moved to different schools (co-facilitator and one particularly engaged participant). However, because we lacked the capacity to follow up with all teachers, we did not incorporate this data into our analysis but summarise the impressions in a separate section.

Participation in all phases of the research was voluntary, and explicit written permission to gather and disseminate evidence for the study was obtained before any work commenced. Teachers' names are used with their express permission and encouragement, and the account has been validated by them.

FINDINGS: PROGRAMME CONTINUATION AND CHANGES IN THINKING AND PRACTICE

Our present analysis of Phase-4 data from the wider group of teachers corroborates earlier findings (Phase 3, Hennessy et al., 2016), indicating that at least some of the original teachers sustained their new practices over the 18 months of Phase 4. The new teachers who came on board described similar kinds of change – despite virtually no input from us (RQ1, RQ2). For example, they had introduced mixed-pace grouping and found that faster learners were helping the slower learners, seeing pupils as more capable, etc. Illustrative examples from Phase 4 are given below⁷.

Broader Range of Teaching Strategies

The most significant concrete change related to participation in the OER4Schools TPD programme was that a large proportion of the teachers developed a broader range of teaching strategies to draw on, namely dialogue, questioning and group work, as promoted by and illustrated in the programme. In particular, video exemplars – used as a stimulus for discussion rather than models to copy [as extensively covered in Hennessy et al. (2016)] – are themselves sustainable and reusable; they have proven very beneficial in widening exposure through illustrating approaches in action in similar, low-resourced contexts. One example came from Chobe: "I really liked [the video on peer assessment], because there are times that you want to get to something and you don't know how to [e.g.] phrase the questions to ask the learners. I really found that [video] helpful".

The experiential nature of the programme was likewise important in deepening understanding of the new approach. Participants clearly stated that the workshops themselves,

⁷Interested readers may like to see additional examples in our Data Collection <https://doi.org/10.5281/zenodo.3604739>.

compared to just reading, offered opportunities to work with peers to develop a solid grasp of the materials. For example, Anthony commented that “most of the time when you come to a meeting after [you] read [the materials], that’s when I must really . . . understand it”.

As a result of these changes in teaching practice, a few participants reported an increased sense of professionalism and confidence. For example, after deliberately setting herself a challenge in teaching technical drawing for the first time using GeoGebra software, Aggie concluded, “Now I can teach any subject!” Teachers linked their expanded pedagogical repertoire directly to increased interaction with and between pupils as well as increased pupil motivation: “Learners are very interested in their lessons, because there is variety now . . . the teacher will even learn more as they are teaching” (Doreen); “they know that they’ll get something from you” (Francis). Several teachers suggested that, by increasing student motivation, OER4Schools increased pupil attendance. There were more diverse learning experiences for pupils too: “Now that they’re using more methods where they interact, they come up with this on their own . . . you will notice that, actually, there are other pupils who may just have been copying in the past” (Doreen). Teachers felt they could now be more responsive to pupils’ needs: “There has been a shift where now you can teach . . . the way the learners want to learn because you allow a lot of techniques” (Clive).

Participating teachers reported an increased focus on their pupils’ learning. This seemed to result from their broadening pedagogic repertoire and greater confidence; it relates to a changing perception of their own roles and professional identities as another lasting impact of the programme. Our data suggest that participating teachers are now taking more responsibility for pupils’ learning and well-being (Culturally Responsive Pedagogy: Brown-Jeffy and Cooper, 2011). For instance, Doreen asserted, “It’s like we focus more on the learner because whatever you’ve done, you ask yourself the question, is this going [to benefit] the learners or not?” and Sydney recounted that even outside school “[pupils] discussed what they learned. . . . In my opinion, that I think they remember what [they learnt]”.

Given that this broader range of teaching strategies is associated with improved learning outcomes for children (Westbrook et al., 2013), and given that the change persisted over time, we viewed this broadening as a core indicator of the project’s success in achieving sustainability (Haßler et al., 2018, and references therein).

Greater Awareness of Pupil Progress

Participating teachers had previously tended toward focusing on their own teaching rather than on pupil learning (OER4Schools programme elements: Assessment for Learning). After participation in the programme, which continually emphasises attention to learners’ needs, they began monitoring pupils’ progress, participation and their own teaching practices (Culturally Responsive Pedagogy; *ibid.*), as Chobe reported.

Chobe: There was something I was reading just on that laptop, where it was saying assessment is not about ability, but achievement. Alright, so it changed my focus to say, “I

should not push a child to say, ‘Hey, you can’t . . .’”, but the slightest achievement they have made, that’s development. . . . It’s been in my head to say, “Okay. . . when I assess I am looking at the progress [of] the child”, . . . [When] I read then it touched me, and every time I teach I will be able to look at that.

Likewise, Clive reported his shift toward noticing more often when pupils are struggling (van Es and Sherin, 2008), and reflecting in between lessons about how to support them – rather than just recording marks as in the past.

Clive: “What am I going to do about the learners, or those who have failed?” – I never used to think much about that. I could just maybe do one or two things about it, but as for now I think the thought has changed, mostly when I assess the learners it even pushes me to go to the point where even you try to see . . . why have the learners failed? Especially, I could sometimes look at the questions that they failed, then from there I could see it to say, “What is it that I’m going to do as a teacher for these?” Because, usually, we don’t – I never used to do that. [. . .] That’s a new thing to me, that’s the change that has taken place.

Greater awareness of pupil progress enables teachers to evaluate themselves and engage in critical reflection. For example, Doreen “realises that sometimes [it] is the teacher who fails” and wonders how the teacher can help the students to “express themselves”. It also enables teachers to give better feedback to pupils, recognised as an important aspect of effective teaching. Again, as this has persisted over time, we see this as a further indicator of the project’s success in achieving sustainability.

Changing Roles of Teachers, Pupils, and Classroom Culture

Participation changed the roles of both teachers and pupils and was reported to have improved classroom relationships (Culturally Responsive Pedagogy; *ibid.*; OER4Schools programme elements on interactive teaching and Leadership for Learning). Doreen described learners as follows: “They are closer to the teacher, even some things they will not say in the past, they say them to the teacher [now] . . . and they can be allowed to make mistakes”. Clive corroborated this, identifying the biggest shift in terms of “now the pupils can come to you to ask even to say ‘Sir, can I do some research here?’” He contrasted this with previous practice.

Clive: Mostly when we were using lecture method it was more like you were a master. . . . That guard between the pupils and the teacher was wide, but [through] this . . . programme about interactive teaching, it’s like now that barrier is almost being broken. Pupils, they feel free to talk.

Others confirmed that pupils themselves were more proactive and participative, so teacher authority was less necessary: “Not only the teacher [is] holding the knowledge and pass[ing] to the children, but the children also come up with some ideas” (Francis), and “We are just walking around and pupils are teaching themselves” (Abel).

Reaching this level of learner agency was not necessarily rapid or straightforward, of course. It required a major shift in mindset and in pedagogical practice to meet the challenge of developing productive ways of drawing out ideas from pupils and responding to their difficulties. Jarney saw his “pupils more as partners in the learning process”.

Our analysis suggests that a sustained change beyond pedagogical shifts was emerging. Specifically, a sustained shift in classroom culture had occurred in teachers’ respect for learners’ opinions, pupils’ proactivity and engagement, peer collaboration, support and tutoring instead of competition and ridiculing/shaming. This theme had already emerged in Phase 3 (Hennessy et al., 2016), and it is notable that several teachers – spanning all cohorts – developed this theme of changing classroom culture further in the Phase 4 interviews. It is particularly significant that the 2012 teachers raised this again 2 years later in 2014, for example:

Judith: They [would] be absent sometimes [through] fear [of] being laughed at. But [now] . . . nobody feels out of place, because they are all the same and it’s just the duty of the teacher now to identify those who are not very good, so that they are helped to try to match up with their friends.

However, introducing mixed-pace grouping brought its own challenges, as teachers discovered the need continually to revise and develop their classroom management strategies. What resulted was a safer environment for pupils to learn through their own mistakes, as illustrated in this discussion:

Clive: The only challenge that I have is that when you mix them like that [. . .] those who know better than the others will speak a lot . . . it’s a problem to others, those who are not contributing. [. . .]

Mutafta: Then also as a teacher you need to control those who are gifted . . . so that they don’t boast that they are more intelligent than their friends.

[. . .]

Miriam: [Now] the teacher changes the leaders. [. . .]

Judith: And . . . they no longer laugh when someone makes mistakes, they just have to listen and if someone knows the answer, [they] will say the answer correctly. But the issue of laughing at each other is no longer there.

Providing a safe environment was framed as a moral issue by the facilitators: “If teachers care for the children they will try to engage with the programme and learn from it” (Agness). One facilitator eloquently outlined his change of mindset and the long-term impact on pupils.

Abel: All we [knew] before this programme started, was just to teach for a specific area in a specific subject in order for a pupil to pass exams. However, the inception of interactive teaching, it has really broadened my thinking; it’s not all about exams or testing. [. . .] In interactive teaching and learning we build . . . self-motivation. We build self-character, we build self-morale. We build an individual who will be able to stand on his [or] her own in . . . real-life situations.

It takes time and effort for teachers to develop a deep understanding of new approaches, and effective facilitation is central here. In a Phase 3 workshop (2012), Abel offered feedback to his colleague Agness, questioning whether her proposed activity involving pupils collecting different types of plants and determining if they are similar or different was a form of genuine ‘inquiry’. He asked her how she would question the pupils: “Are they going to be deep questions, are they going to be thought-provoking questions? [. . .] Are they going to be open-ended?” Agness rose to the challenge by formulating a new question for learners: “Why is it not a flowering plant?”

Individual changes in pedagogic practice can sometimes be abandoned over time or remain superficial (for example, adopting a ‘magic-microphone’ technique to make pupil participation more equitable is a start but does not guarantee the nature of that participation or its implications for learning). However, we argue that newly developed knowledge of, and competence in, interactive teaching, are more likely to be sustained in a school community in which teachers and pupils – and ideally also headteachers and parents – are changing their epistemological stance on teaching and learning.

Moreover, research has suggested that such emergent re-conceptualisation of the roles of pupils and teachers, when shared and discussed by colleagues as is the case here, can make teacher-led pedagogic change appear more feasible, positioning teachers themselves as change agents, rather than solely recipients and implementers (Rainio and Hofmann, 2015). This change is epitomised through the description by two of the facilitators of the programme as “opening up their minds” (Chobe) as teachers; this may even reduce the need for exposure to all of the material:

Chobe: If you can just make them taste the goodness of [the programme], I think it will . . . help . . .

Rachael: This is what we are saying, some people just brought a negative attitude.

Chobe: Yeah, so I’m saying we should just do it for a short time to help them see the importance of this.

Agness: . . . Through this at least you are able to open up your mind and you’re knowing new things, and that’s how it’s supposed to be as a teacher [. . .] Some people know . . . this, but they don’t know how to implement it in the class. So this learning is something really good.

FINDINGS: WIDER INFLUENCES ON PARTICIPATION AND ENGAGEMENT OF STAKEHOLDERS: LESSONS LEARNED

Some additional insights arose concerning the sustainability of school-based TPD in SSA (RQ3): What are the lessons that might be learned regarding mechanisms promoting sustainability and cultural appropriateness of TPD for LCE in the SSA context? What further mechanisms might strengthen the approach? We outline the key issues addressed, including the motivation of teachers and school leadership, and how a long-term TPD programme might best be scheduled.

Sustaining Teacher Motivation and Facilitator Strategies for Increasing Participation

Teacher motivation is crucial to participation and sustained involvement over time. Increased morale and an enhanced sense of what is possible do not necessarily promote change; teachers need to “develop confidence to see how they can make deep and sustainable changes to their teaching repertoires that have a positive impact on the learning of their pupils” (Buckler and Gafar, 2013, p. 128), through ensuring that TPD content genuinely reflects realities of working contexts, and through opportunities for critical reflection on classroom challenges. Our studies show that developing confidence to try out new techniques and use new technologies requires a ‘leap of faith’ (Hennessy et al., 2015): practitioners may trial novel approaches when they are expected to do so as part of an ongoing programme, yet if they do not find the experience worthwhile, they will not continue and changes will not become embedded.

The issues of teacher absenteeism and lack of shared accountability (UNESCO, 2014) also arose in the reports. In Phase 4, the headteacher reported that she had made attendance mandatory, and the teacher interviews made it very clear that this had been understood, and that a register was taken. The headteacher’s register indicates average attendance of around 60%, which is similar to records of other school meetings. The register also showed that the programme was at times interrupted by ‘other business’ (such as introducing a new syllabus in early 2014), which is common (e.g., Piper and Mugenda, 2013). Facilitators did report that some teachers kept missing sessions, coming late or wanting to finish early and teachers gave all kinds of reasons why they could not attend or had not completed assignments; facilitators spoke of a “habit of excuses” and teachers “who don’t care for the children”, asserting that a degree of compulsion is necessary for attendance.

The main factor in commitment to the programme seemed to be teacher motivation: a teacher living a long way from the school arrived on time for the sessions (outside their usual shift) and participated, while teachers who lived closer did not always do so. A facilitator explained that teachers enter the profession for a variety of reasons, and “some are born teachers”, while others are a “teacher just in name” (Agness). The headteacher stated that “it’s a good programme, but . . . there are some teachers who have not accepted it fully”. The variable attitude to attendance created some problems. Teachers who had been absent said it was hard to catch up, while teachers who participated more fully were bored when facilitators repeated material. A potentially effective incentive may be certification, which was frequently requested by teachers. Certification should be locally accredited, and relevant for career progression, which often is not the case (Mazala, 2009).

Seeing new pedagogies in action and teachers subsequently trialling these themselves constitutes a route to initiating pedagogic change. Seeing a peer trying out a new technique is a powerful motivator. In terms of extending beyond those teachers who are inherently keen to learn and interested, the facilitators recognised that they hold the key: they need to be practising a new approach in class themselves, both to persuade

other teachers of the benefits and feasibility, and actually to demonstrate it in practice.

Abel: If we practise in our classes, even as they are passing they will be seen; “This guy teaches differently, look at him”.

The facilitators also construed workshops as demonstrations in themselves: Some teachers pointed out that, in teaching about interactive pedagogy, the workshops themselves should be as interactive as possible. Both teachers and facilitators suggested more active roles and responsibilities for the non-facilitator participants during workshops as a possible solution to improve attendance.

Chobe: What we can do is we give each other a chance [to present in the group], especially with those that don’t want to attend. . . . We can just guide them to say, “Okay, [. . .] I want you to do this during the meeting”.

Since all participants have the course materials, the responsibility to prepare for certain activities in the next session could be shared, thus increasing engagement.

Given their pivotal role, the choice of facilitators is extremely important (Hennessy et al., 2016; Haßler et al., 2018). Selecting them needs to be done transparently so that it is clear that there are no financial benefits. Like participants, facilitators should receive recognition for their role – for instance through a facilitators’ certification programme, linked to career progression. Facilitator availability can be limited: Mutango reported: “At times we’ve asked that person so come and show us how to go about it, but this is a busy school and they are also having their own things to do”. An important question is to what extent the role of facilitation for entire sessions can feasibly rotate among peers – as an extension of facilitating individual activities and co-facilitation. One teacher, Annie, suggested that facilitators change termly; while this would serve to share workload, responsibility and leadership, it does depend on having a sufficient number of facilitators available and may obstruct longer-term and deeper facilitator capacity-building.

Importance of School-Level Support for Self-Sustaining Innovations

Effective programmes recognise the interplay between teacher and headteacher professional development. Headteachers need to be fully on board if changes to TPD and classroom practices are proposed. The facilitators felt that they were leaders of the professional learning but without authority to persuade the teachers to participate.

Teachers were concerned about the lessons going as planned and felt that with the previous style of teaching, there was a greater chance of completing the lesson in a superficial way. With more interactive lessons, there was an expressed fear of not completing the lesson, and teachers found that more lesson planning and research were needed. Further challenges to implementing pedagogic ideas related to taking children outside for lessons. Although the headteacher indicated that this was not a problem, one teacher mentioned that permission had to be

sought and it did appear that in practical terms it could be met with disapproval. Indeed, teachers felt that conducting part of an inquiry lesson outside in order to use the resources on the site, or conducting fieldwork off-site, may not be seen as “real teaching”, and that they had to justify this decision in order to avoid accusations of time-wasting.

A successful, culturally contextualised strategy for this was to produce written lesson plans that could be shown if challenged. Also, some teachers reported that senior leaders accepted their explanations, especially if informed in advance. Disapproval from peers was less of an issue. Four teachers highlighted the issue of raised classroom noise levels; for instance Clive reported being “told off” and stated that senior leaders “want to silence them”, whereas to him ‘noise’ indicated that “learning is taking place, learners are free to discuss”. Mary pointed out that class management was important to avoid disturbing neighbouring classes.

Unlike some other issues raised in the interviews and workshop discussions that facilitators perceived as excuses, this issue of disapproval of new techniques was picked up and discussed by the facilitators at length, suggesting genuine concern. Facilitators reassured participants that interactive teaching taking “the whole day is not an issue – as long as your planning is there” (Abel). This also illustrates the importance of leadership in facilitating the workshops and productively solving problems that arise.

Given the difference between the stated Zambian curriculum (which advocates interactive practices) and the transacted curriculum (rote learning; cf. Nag et al., 2014, p. 14), it may not be surprising that while a school leadership team is in principle in favour of interactive pedagogy (endorsing the programme and creating a time and space for professional learning workshops), the practical details of this may be unfamiliar. It seems there can be support in principle, e.g., for attendance, but not necessarily support (leadership) for learning.

Follow-Up Beyond Phase 4

As the programme had already been sustained for some time beyond the initial phase, we decided to conduct follow-up telephone interviews with the three participants who had led the programme and/or moved schools since then. In November 2015 – 1 year after the conclusion of Phase 4 – these interviews were conducted with the lead facilitator at Chalimbana Primary School (Abel), as well as a co-facilitator (Agness) and one participant (Aggie), both now at other schools. Abel estimated that about half of the teachers were still actively drawing on the teaching practices of the programme, while around a quarter (mainly new teachers) were in the process of learning those new teaching practices. The remaining quarter (weighted toward Grades 8 and 9) were not implementing these as much as their colleagues in lower grades. The ongoing teaching practices attributed to OER4Schools included greater involvement of pupils, model making, and more learning-focused practical work. The latter is already envisaged by the current syllabus but had previously been practised only in a ‘shallow’ way. Mixed-pace group work had become embedded and presented as something extremely beneficial, especially for weaker students.

For Aggie, the use of traffic lights (Assessment for Learning) had been extremely beneficial and was used daily. She had also significantly extended the degree of parental involvement envisaged in OER4Schools, inviting parents in her new school to observe lessons. Aggie cited parents seeing their children being engaged through group work as a significant factor for improved attendance and learning outcomes. Increased achievement by her Grade 3 class compared to two other Grade 3 classes was reported: Even the “pupils that were labelled to be slow learners [in my class] are doing much better than the other pupils in the other classes. For me, they are not slow learners any more”. The headteacher had noticed this, and – having noticed Aggie peer teaching her colleagues – had tasked her with running teacher group meetings, in order to engage teachers across the school in her style of teaching and to raise attainment.

While Agness also continued to use interactive teaching practices at her new school, there was little wider buy-in from her colleagues and she attributed this to the overall challenging situation of the school in a deep rural area.

At Chalimbana Primary School, a new government programme supporting reading and writing was the focus of weekly teacher group meetings in 2015 (rather than OER4Schools), which is understandable given time constraints. However, Abel reported that implementation of this programme was more effective than at other schools, attributing this to teachers’ experience of OER4Schools. Despite compulsory attendance, participation in the government programme appeared to be somewhat lower than it was during the OER4Schools workshops in the previous year, which was attributed to teachers’ ongoing dissatisfaction with their conditions of work and lack of resources.

While this additional evidence is not extensive, it nevertheless suggests that there is a degree of continuing positive impact on learning cultures as an outcome of the programme.

DISCUSSION

In this paper, we considered whether a holistic approach to TPD addressing the quality of education can be sustained in a low-income country setting in SSA to improve the quality of learning – and how. We asked, firstly, what evidence there is that the programme was continued (RQ1). The present data demonstrated that a teacher-led, school-based, peer-facilitated model of TPD supported by multimedia resources can be self-sustained over time (RQ1, RQ2). Through purely peer-facilitated TPD without outside intervention (Phase 4), teachers’ attention focused increasingly on pupil learning, responding to the priority of inclusive, high-quality Education for All (SDG4). Teachers described how they continued implementing new ideas despite the challenges experienced (Sriprakash, 2010); the role of the teachers as self-empowered agents of change needs to be recognised.

It was beyond the scope of this study to measure attainment directly, owing to lack of comparison groups, although it would be ideal to do so in future trials with larger samples. Likewise, investigating sustainability beyond the main funded period meant that carrying out systematic observations or directly

capturing learners' perspectives and understandings were beyond the scope in this final phase of our research.

A Leadership for Learning Perspective on the Findings

The Leadership for Learning approach (Frost, 2014) offers a useful lens for an overarching analysis of our results with respect to our original research questions. There was evidence that the LCE approach underpinning the TPD programme was sustained (RQ1) and spread to further and new colleagues (RQ2). Our data suggest that this emerging Focus on Learning – of teachers and pupils – is evident in the accounts of teachers who were actually engaged in the programme (e.g., Aggie's reference to Leadership for Learning, November 2012, in Data Collection). The Focus on Learning could be construed as both a mediator for change and an outcome of the changes, creating positive cycles of reinforcement and, therefore, supporting sustainability. However, there is no specific evidence that this was a school-level attitude but rather an emerging attitude of some teachers – although concern with low pupil attainment, especially in English, originally motivated the participating teachers to persuade their colleagues and headteacher that expanding OER4Schools could address this. To some extent, teachers appeared to be able to create the Conditions for Learning within their classrooms, but there are also reported cases where teachers got into trouble for taking the children outside or having higher noise volume due to class discussions. Effective TPD requires structured opportunities and time set aside for Learning Dialogue, i.e., for teachers to discuss pedagogic ideas in the workshops and beyond. However, lessons learnt include the desirability of more learning dialogue with school leaders, especially to mitigate the risk of lack of leadership support.

Shared Leadership was elusive at Chalimbana Primary School at the time of the study, for as Abel described, he was the workshop leader, leading the professional learning but without authority or availability of incentives to entice the teachers to participate, let alone actually share leadership with their seniors and peers (RQ3). Shared Accountability – namely, making teachers accountable for their own and their peers' professional learning – is problematic, and typical TPD programmes in SSA tend to mainly require attendance, rather than accountability for learning. While some teachers related the programme to their previous learning (especially realising the benefits of what they were taught in college but had not used) and explicitly recognised that it was for their own and the children's benefit, overall a culture of professional development across the school still needs to be developed. While teachers are partly accountable for the attainment of their children – as evidenced by end-of-year tests – teachers are generally not accountable for their own learning. Moreover, in many countries in SSA (including Zambia), the headteacher's role is usually one of a manager, not of a supportive leader of children's learning, let alone teachers' learning.

Factors Underlying Sustainability of Pedagogical Changes

Sustainability is likely to depend on how successful the classroom trials of a new approach in the local context are perceived

to be, how closely the approach fits with existing curricula, practices and policies, and whether it offers an appealing way to address perceived issues. The interactive pedagogy that underpins OER4Schools is intended to lead to more responsibility and autonomy for learners, and to develop independent thinking and problem-solving skills. This might be regarded as an unwelcome challenge to the traditional hierarchy of authority within the wider society, encouraging increasing liberalisation and democratisation; it is not confined only to classroom practice and could even be considered subversive. In the schools we worked with, however, the new approach turned out to be largely welcomed by teachers and school leadership, and to some extent viewed as a release for teachers from the uncomfortable position of sole authority in the classroom. Rather than instructing teachers to abandon their existing practices, teachers were invited to trial and broaden their repertoire and understanding of new teaching approaches. Participating teachers often commented to us that they were previously unaware of the possibilities for teaching differently but found it very successful, especially in terms of learner participation and engagement, when they tested out the new techniques (Hennessy et al., 2016). Collegiality and increased professionalisation developed through the programme's new opportunities for peer dialogue were found to provide motivation, without recourse to financial incentives.

These insights resonate with a major finding of the EdQual projects that “where teachers and headteachers have been empowered to identify and act on issues of quality through forms of professional development they have been motivated to do so” (Tikly, 2011, pp. 12–13, citing Bosu et al., 2011). Exposure to new ideas, of course, needs sensitive handling to avoid perceptions of threat to existing roles (Tabulawa, 1997). An important message is the need for ring-fenced time for the professional development of teachers and senior leaders to focus on effective classroom pedagogy, and on developing shared responsibility across the school for both student and teacher learning. While headteacher participation in school-based workshops may, in theory, have addressed some of these issues, teachers feeling intimidated is clearly a risk in settings where senior leaders do not normally teach, and a cultural shift is needed to address this.

CONCLUSION

The OER4Schools programme responds to the need for large-scale, sustained development opportunities for teachers, as conceptualised through the government's SPRINT framework. Within the overall working conditions and infrastructural constraints – similar in Zambia to those of many SSA countries – it offers avenues that mitigate some of the challenges faced by education systems in SSA. It supports TPD leaders in facilitation, emphasises teacher ownership and leadership, and includes a coherent set of educational materials, iteratively developed within – and tailored to – the country context (Penuel et al., 2013). Our research over 5 years demonstrates a promising degree of sustainability and local widening of the approach in the adoption of new pedagogical practices and changed

classroom culture, which persisted over time with minimal external support. Overall, the TPD appears to be pitched at the right level of challenge for the teachers. While the programme is structured, it gives teachers agency to extend, develop and implement classroom practices, as well as assess their own learning (Brown-Jeffy and Cooper, 2011). Its participatory, iteratively developed and culturally responsive nature (Penuel et al., 2013), emphasising local ownership and teacher voice, is construed as an important precondition for sustaining pedagogic change and adoption by new teachers, as well as continued evolution and impact after the funded period of programme development. This unique programme – together with the insights derived from our research conducted well beyond the funded period to establish longer-term impact – means that our outcomes offer a truly significant contribution to the field of teacher learning in SSA. While the research was limited by funding constraints, we have argued above that the results appear reliable within the scope set out by the research questions.

In another publication (Haßler et al., 2018), we revisit and synthesise the evidence across our studies in order to extract the main factors in sustaining and indeed scaling up such a programme in a wider context, and offer recommendations for pedagogical and programme design in low-resourced settings. Insights from the programme have influenced the design and execution of the Transforming Teacher Education and Learning programme (2015, Ghana); last year (2019) the programme was adapted and trialled in a small cluster of schools around Mpumelelo High School (Nkayi district, Zimbabwe). The iterative approach for developing teacher professional development through Design-Based Implementation Research detailed here significantly influenced the approach of the EdTech Hub, an 8-year multilaterally funded programme⁸. The programme researches which kinds of technology use in education systems improve learning outcomes for the most disadvantaged and marginalised children in low- and middle-income countries.

Finally, we note that evidence from past crises as well as emerging evidence from the current pandemic already shows that the extended global school closures due to the COVID-19 pandemic are highly likely to cause significant learning loss. In low-income countries, where learning gaps are already prevalent and many children lack access to remote learning while schools remain closed, the learning crisis is exacerbated even further. Upon re-opening, schools will need to implement evidence-based interventions to identify and address these learning gaps. Moreover, due to local variation in pandemic circumstances, and the scale and unprecedented nature of the emerging problems, there

will be an inevitable need for local, school-based strategies. This in turn will require significant school-led professional learning (Hofmann et al., *forthcoming*). Our research on the OER4Schools model offers a particularly timely model for supporting school-led, self-sustaining innovations to support teaching and learning in low-income settings with and without technology.

DATA AVAILABILITY STATEMENT

The data supporting the conclusions of this article have been made available by the authors in the form of a Data Collection at: <https://doi.org/10.5281/zenodo.3604739>. The interview schedule is available at: <https://doi.org/10.5281/zenodo.3604743>. The authors consider the teacher development programme as part of the dataset; it is available at: <http://oer.educ.cam.ac.uk/>.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Faculty of Education, University of Cambridge. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin. Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

AUTHOR CONTRIBUTIONS

BH and SH jointly designed and conducted the field research on the OER4Schools programme over several years. Most of the data in this paper derive from Phase 4 (2013/14) and was collected by BH. In order to provide an independent lens, the data analysis was conducted by RH who had not been involved in the design or data collection, other than the design of these interviews. All authors contributed to the writing.

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⁸ <https://edtechhub.org>

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