Sustaining and Scaling Up Pedagogic Innovation in Sub-Saharan Africa: Grounded Insights For Teacher Professional Development

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Abstract: Developing sustainable and scalable educational initiatives is a key challenge in low-income countries where donor-funded short-term projects are limited by both contextual factors and programme design. In this commentary we examine some of the issues related to in-service teacher development in the context of sub-Saharan Africa, grounded predominantly in our work of over five years of iteratively developing, refining and evaluating an intensive school-based professional learning programme for primary school teachers. 'OER4Schools' integrates interactive pedagogy, Open Educational Resources (OER) and the use of mobile devices (where available). Our focus here is on identifying what the main factors are perceived to be in sustaining and scaling up such a programme, from the perspectives of participating teachers, workshop facilitators and the research team. Synthesising our previous research and drawing on recent work in the field, we identify the key characteristics of effective and sustainable professional learning in low-resourced contexts. Such characteristics include effective peer facilitation, school-based active learning, explicit programme structure, appropriate scheduling and resourcing, and mitigating resource constraints through the use of OER. Our conclusions offer insights concerning the importance and impact of wider influences on participation and engagement of stakeholders and lead to recommendations for future programme design and implementation.

Keywords: teacher professional development; Sustainable Development Goal 4; sub-Saharan Africa; Open Educational Resources; peer facilitation; school-based active learning

Introduction

In order to increase the life chances of disadvantaged children, including in sub-Saharan Africa, the post-2015 development agenda is focussing on raising the quality of teaching and learning in schools (UNESCO, 2014; Sustainable Development Goal 4[1]), and, in particular, on supporting teacher learning. There is an increasing consensus that African teacher education needs to focus on more effective and culturally appropriate pedagogical practices, both in the classroom, and in teacher professional development (TPD) initiatives. However, prevailing TPD models tend to focus on one-off 'top-down' teacher development 'interventions' that are now recognised as being ineffective (Moon et al., 2013; Bett, 2016; Wedell, 2009), and new approaches are being trialled (Piper & Zuilkowski, 2015).

In this article, we conceptualise essential features of an alternative approach: school-based teacher professional development (sbTPD). Such models with distributed leadership, ongoing classroom trialling, and sufficient scaffolding sustained over time are favourable regarding

cost, scalability, and effectiveness (Orr et al., 2013; Westbrook et al., 2013, p. 60-64). They include whole-school in-service approaches (with clustering) and reflective communities of practice; TPD must recognise the "everyday realities of the classroom, and the motivations and capacity of the teachers to deliver […] reforms" (Hardman, Ackers, Abrishamian, & O'Sullivan, 2011, p. 670).

However, cascade models of 'knowledge transmission' ('lectures' and rote learning for teachers) remain dominant. It has been recognised for over a decade now that such 'training' often lacks relevance for the audience. Simplistic cascade models with little classroom follow-up are particularly problematic (Orr et al., 2013; Bett, 2016), especially where purporting to focus on student-centred, active learning, critical thinking and problem solving (Leu, 2004, p. 2). The elements of "modelling [interactive teaching and learning], process and structured practice in which teachers play an active role" (*ibid.*) — the central tenets of effective TPD — may be lacking. In a TPD programme in Kenya (1999–2005; Hardman et al., 2011), for instance, key resource teachers (KRTs) were trained to lead TPD within their subject area in their schools. While significant changes were observed, those centred on the KRTs themselves (62% of KRTs used some form of peer interaction in their lesson, compared to 17% of non-KRTs; *ibid.*), indicated the traditional challenge with cascade models: the concentration of expertise at the top of the cascade (Hayes, 2000).

Cascade models remain popular partly because their evaluation can be simple, relying on monitoring of inputs or self-reported outcomes, over short timescales. However, such monitoring is problematic due to gaps between self-reporting and actual classroom practice. For example, Hardman et al. (2008) suggested that code-switching and chorus responses were under-reported, while group work was over-reported. Such discrepancies have important implications for approaches to TPD relying on a rote-learning-for-teachers approach as a mechanism for pedagogical change: if pedagogy is discussed abstractly, but not practically explored and reflected within communities of practice, change is likely to be superficial even if positive outcomes are self-reported. Where new technologies are introduced, the problem is exacerbated, since teacher induction is often very brief (one day) and technologically rather than pedagogically focused, with little attention paid to classroom practice (Hennessy et al., 2010).

Focus of Our Analysis

This commentary seeks to synthesise emerging messages from prior empirical work in the field. Despite our own and others' insights offering evidence of change, systematic TPD research in SSA is in its infancy. The statement below regarding TPD research in a high-income country is even more relevant in low-/middle-income countries (LMICs).

Developers and policymakers urgently need more rigorous evidence that describes how professional development design elements impact the likelihood of program success. This is particularly important as most professional development is home-grown; it arises from district or local developers' needs and interests, has a relatively short shelf-life, and proceeds with little or no formal evaluation. (Hill, Beisiegel, & Jacob, 2013, p. 476; our emphasis)

Rather than case-by-case, hard-to-compare evidence, we need systematic insights into why change occurs and what made this possible.

This article conceptualises an evidence-based sbTPD approach that allows pedagogic innovation to be embedded, maintained and scaled in SSA. It contributes to answering the question:

What TPD programme design principles and characteristics are conducive to effective, sustainable and scalable TPD programme implementation and execution?

We challenge overly prescriptive models and the orthodox practice of centralised (extrinsically motivated) teacher development (including some forms of online learning) with limited provision for school-based processes and without demonstrable sustained impact on pupil learning gains, and simplistic cascade and coaching models, intended to work without extensive scaffolding. While current TPD research in SSA does not meet the rigorous standards advocated by Hill et al. (2013), the existing evidence does suggest that the approach to sbTPD conceptualised here may be a viable alternative, with the potential to address quality (and social justice) through a cost-effective, sustainable and scalable model.

Our article outlines the supportive factors underpinning TPD implementation in SSA, grounded in the literature and our own experiences with the OER4Schools programme as an instrumental case. We reflect on the challenges experienced, design and cultural appropriateness of our programme, and its perceived success in terms of reflexivity, buy-in and local ownership as well as teacher development and changes in practice. We outline the key facilitating and constraining characteristics, including teacher motivation, attitudes of leadership and external expectations embedded in wider societal structures.

An Instrumental Case: OER4Schools

The OER4Schools programme seeks to offer an effective, sustained and holistic TPD model that is scalable. Our research over five years demonstrated that the OER4Schools sbTPD approach led to a range of new practices emerging. At the teacher level, changes included raised expectations of pupils, adapting to their knowledge levels, use of more practical and collaborative work, and integrated technology use. Challenges included motivating teachers through head teacher support, opportunities for career progression through meaningful certification, plus avoiding superficial application of interactive teaching approaches. Students built deeper subject understanding and engaged in genuine problem solving. Our research offers evidence that peer-facilitated sbTPD can be effective, scalable and sustainable when it focuses on active teacher learning and 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 (Hennessy, Hassler, & Hofmann, 2015B). Such a model can help to build teacher capacity and increase participation and achievement of all pupils (Hennessy, Hassler, & Hofmann, 2015A).

Alongside the research, drawing on its emerging outcomes, researchers and participants iteratively developed and trialled OER4Schools[2], an sbTPD programme suitable for low-resourced schools and teaching practice in colleges, freely available as an Open Educational Resource (OER; Creative Commons licensed; accessible, downloadable: Hassler & Mays, 2015). Weekly Teacher Group Meetings (TGM) explore interactive teaching principles, group work, questioning and dialogue, Assessment for Learning, and enquiry-based learning. Materials include texts, practical activities, unique video exemplars of interactive practices in Zambian and South African classrooms[3] (with or without technology) and built-in facilitator notes.

The observed changes were sustained over three years in one main research school, Chalimbana Basic School, a government school with 40 teachers and around 1000 students (Grades 1–12), serving a mixed SES, rural community. Following a one-year trial of the full programme in 2012, the entirely independent and spontaneous discussion and decision during a full staff meeting to extend the OER4Schools programme to the whole school in 2013, in the belief that it would raise pupil attainment, provided evidence of its genuine endorsement by the teachers. Importantly, little external support was available to the school during that subsequent period. The original facilitators were joined by two self-selected teachers, who, supported by the concrete TGM materials, worked with all colleagues. Unlike typical cascading, the timescale here is a year: facilitators and the smaller group of teachers practised together for a year, before all teachers became involved, working in two parallel groups. The new joiners likewise changed their perceptions and reported changes in practice. Many of the original teachers continued to develop as well. Elsewhere, we discuss the inevitable obstacles (Hassler, Hennessy, & Hofmann, forthcoming) and provide empirical evidence including an *extensive data appendix*; selected quotes captured at the end of the two-year unsupported programme extension (June/July 2014) and from follow-up interviews a year later (November 2015) supplement our account here.

Characteristics of Effective and Sustainable Programme Development and Implementation

How can TPD programmes be of high quality (educationally effective), as well as cost-effective, whilst allowing for sustainability and scaling? An obvious consideration, perhaps, is that scaling and sustaining are more likely to occur if this is an explicit focus from the outset rather than leaving scaling and sustaining to a later programme phase. However, less obviously, we may ask: What are the characteristics of effective TPD that enable sustainability and scaling?

Characteristic 1: TPD Must Promote Pupils' Learning (classroom level)

Ultimately, effective classroom pedagogy (improving learning outcomes, responding to local needs) is a necessary condition for sustaining and scaling TPD. What pedagogical practices are most effective in supporting pupil learning in LMICs? The strongest evidence comes from a number of in-depth and rigorous reviews. Westbrook et al. (2013) found that three specific strategies (feedback, sustained attention and inclusion; safe environments; drawing on

backgrounds) impact on pupil learning outcomes, and certain practices are characteristic of effective teachers (whole-class dialogue, group work; questioning; pedagogical content knowledge; code switching; lesson sequences). They concluded: "Brought together as a package in an intervention or carefully constructed curriculum, supported by relevant professional development, they might make a considerable impact on student learning" (Westbrook et al., 2013, p. 2). Although developed earlier, OER4Schools is aligned with those findings, constituting such a 'package'; it offers effective support for teachers in developing such characteristics (Hennessy et al., 2015B).

Characteristic 2: TPD Must Effectively Promote Teacher Learning

Much of the evidence in LMICs is small-scale, and the discourse around rigorous and systematic teacher development research is more extensive in developed countries (Hill et al., 2013; King, 2014). However, the above TPD features resonate with: (a) the limited evidence from TPD research in LMICs (Lange, 2014; Moon, 2007; Nag, Chiat, Torgerson, & Snowling, 2014, p. 29; Orr et al., 2013, pp. 75-76; Westbrook et al., 2013, pp. 60-61); (b) the wider TPD literature in developed countries (e.g., Timperley, Wilson, Barrar, & Fung, 2007; Borko et al. 2010, Table 2; Education Endowment Foundation, 2014); and (c) research on children's learning. Hattie's (2009) meta-analysis of over 800 meta-analyses of factors influencing attainment shows an overall large effect size (0.62) for professional development. Given the existing evidence, it seems unlikely that somehow an entirely different set of features would apply to TPD in SSA; these features constitute at the very least a sensible first approach that should be adopted in the absence of reliable evidence to the contrary.

Credible theories of change describing the mechanisms by which TPD leads to deep pedagogical change in the classroom are evident in contemporary models of professional learning (Schweisfurth, 2015). These include construing teachers as reflective professionals, alignment with local context, teacher-led discussion and joint reflection, promoting communities of practice, foregrounding and creating school-based opportunities for active experiential peer learning and classroom trials, with appropriate scaffolding, such as professional development materials. Above all, collegial dialogue is pivotal in these models, with talk construed as the central vehicle for sharing, critiquing and developing ideas, values, and practices ("talk about teaching"; Feiman-Nemser, 2001, pp. 1042-43).

The OER4Schools programme overall, and the materials provided (c.f. Characteristic 7), confirmed the influence of such features. Teachers' reported experiences highlighted the importance of classroom trialling and described this as 'seeing' that these pedagogic ideas matter, as opposed to having been taught them in college but not having previously 'seen' their relevance. Indeed, one facilitator argued that merely getting teachers to trial and observe is enough to make them 'see' the importance of these methods. This resonates with the idea of making student learning visible to teachers (Hattie, 2009).

Interactive pedagogy is not only the message, but also the medium (Schweisfurth, 2011, p. 430). Programmes need to incorporate (and focus on) elements essential for effectiveness (such as reflection and activity planning). Rather than trying to 'plug gaps' in teacher knowledge,

programmes ideally empower teachers to become reflective practitioners, able to identify gaps in their own knowledge and skill, and to acquire these as needed (Hardman et al., 2011).

Characteristic 3: Effective TPD is Predominantly School-Based and Ongoing

What are the conditions enabling effective TPD as outlined above? Teacher understanding of concepts is often superficial or theoretical, and only uncovered through extensive probing. Teachers may already be familiar with concepts, such as group work, from college but may not have fully understood them. Concepts need to be revisited, clarified and explored in some depth. To foster deep change, teacher learning has to be co-located with pupil learning, and effort needs to be focused at school level. Ultimately, insights obtained through 'seeing' can only support teachers in building a deep understanding of pedagogy if there is sufficient time. Expectations regarding the ease of implementation and speed of change are often unrealistic (Schweisfurth, 2011), at both teacher and facilitator levels.

Case studies of flexible and dynamic TPD to improve quality of teaching in six low-income countries by Leu, Hays, LeCzel, & O'Grady (2005, p. 6) concluded that decentralised school- and cluster-based teacher professional development programmes, especially those involving three or more schools, are more effective than centralised cascade workshops characterised by passive learning. With the former, teachers facilitate their own programmes, adapting innovation to their contexts, while supported by human or material resources to consult regarding queries, and by feedback from willing collaborators (colleagues in school or from education offices, teacher colleges, or teacher resource centres: *ibid*.; Schwille & Dembélé, 2007, p. 106).

However, given the significant logistical issues of working at the cluster level only, balancing cluster-based activities with more frequent within-school sessions (sbTPD) is likely to be optimal. This is supported by Lange (2014), where a combined programme in Cameroon influenced teachers' attitudes and classroom practice, with significantly increased use of active learning methods, compared to control classes. However, appreciation of in-service education and attending to learners' individual development were higher on the part of the multipliers[4] than the teachers. This may be explained by the one-year training multipliers received, or the focus on the various pedagogical modules encompassed in the training, indicating that the multiplier training could have been shorter, strengthening school-based components instead (*ibid*.). Another form of hybrid model combining internal and external support is 'work-based learning' (Walsh & Power, 2011), co-locating and interlinking teacher learning and classroom trialling (Mukeredzi, 2016).

Characteristic 4: Mitigating Time Constraints and Adequate Programme Scheduling

School-based approaches of the kind outlined are not without challenges. Research consistently indicates that time is a key constraining factor. Demand can be minimised by doing as much as possible collaboratively in TGMs, with little additional work being expected between sessions aside from classroom trials and occasional readings.

Programme schedules can be varied. For instance, OER4Schools started as a one-year programme (weekly TGMs) but was adjusted by our main research school to a two-year programme (fortnightly) to suit teachers. A hybrid model with a more intensive initial period (say, a set of five sessions during a workshop period, with opportunities for classroom practice) followed by weekly school-based sessions is also possible. However, sessions need to be interspersed with classroom trials between sessions.

Moreover, high staff turnover means that frequently new teachers' needs have to be accommodated in the programme. During OER4Schools, recent arrivals described their difficulties in understanding and implementing the basic pedagogic ideas and uses of technology through TGM participation. One teacher, Mutango, would have preferred his colleagues "to demonstrate to us what they do in their classes", but reported that "at times we've asked that person to 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." As a mitigation strategy, facilitators suggested in interviews that new teachers should form a separate group, ensuring adequate attention but, potentially, also placing more demands on facilitators' time.

Ideally, a programme like OER4Schools takes place within a wider school culture of sbTPD and, within working hours, as part of the school routine. It is in turn supported by a wider culture of promoting effective schooling in the community (Ngalawa, Simmt, & Glanfield, 2015). Setting programmes in the context of a unified wider framework (e.g., SPRINT stipulates a programme of regular TGMs in Zambia; Mubanga, 2012) mitigates time constraints that may otherwise arise from competition with other national or local initiatives.

At scale, programmes could be run for all in-service teachers (followed by an ongoing programme of action research and lesson study); newly qualified teachers could undertake the programme as a post-college programme or, for pre-service teachers, during practice teaching, also offering an opportunity to link sbTPD with pre-service education (c.f. Hardman et al., 2011).

Characteristic 5: Professional Development for (and Retention of) Facilitators

Effective peer facilitators are pivotal to sbTPD, with success depending on the choice of facilitators, and the prior experience needed to facilitate credibility among colleagues (see Hassler et al., forthcoming, for details). Later on a broader base of teachers may become experienced enough to step up, and parts of the facilitation can be handed over but at least, initially, facilitators will need to allocate sufficient time for up-skilling and preparation, as well as providing significant support, in order to develop "capacity for sustaining change in systems" (Penuel, Fishman, Haugan Cheng, & Sabelli, 2011, p. 332).

We argue that it is unrealistic to expect to simply find suitable facilitators as required, yet it is possible to prepare facilitators adequately over time. In the OER4Schools model, potential facilitators started out by implementing interactive strategies in the classroom, and after two years stepped up to initiate and facilitate a whole school process. For programme initiation, we propose that two interested teachers — future facilitators — jointly explore the resource; classroom trials over several months ensures their active learning and, guided by their own

experience of translating the programme into practice, later facilitates colleagues' learning. We suggest that ultimately learning intentions can only be maintained and scaled up if they are grounded in the facilitators' active experience of 'teacher-centred' methods for sbTPD (including the modelling of interactive pedagogies), as well as a deep understanding of classroom challenges. Facilitators (coaches, 'master trainers', circuit supervisors) first need to have the opportunity to learn how to effectively conduct such active workshops themselves ("message and medium need to be consistent", Schweisfurth, 2011, p. 430). OER4Schools offers explicit and extensive scaffolding through 'facilitator notes' available in the facilitator's version of the materials, supporting teachers experienced with interactive teaching in becoming facilitators. Seed workshops focusing on running the programme at their schools and online support for facilitators are also effective. Seasoned facilitators can subsequently support new ones. The OER4Schools facilitators valued both the additional notes and support from more experienced facilitators.

Expecting facilitators to conduct workshops without their own extensive prior learning and without scaffolding is simply unrealistic. For example, studies in Cambodia and China reviewed by Westbrook et al. (2013) showed that new mentors remained textbook-driven and proved unable to support improvement of practice by mentees. In order to ensure fidelity, teachers who become mentors or model teachers require release time: first for their own professional development, then to induct and assist their colleagues in school and provide in-class support.

However, given sufficient time, our detailed evidence for impact on teacher practice and thinking confirms that peer facilitation is successful and remote support becomes redundant over time. Moreover facilitators' own professional development was a notably positive outcome, with new skills and status acquired, which, in turn, contributed to sustaining the programme. The lead facilitator described the process as follows:

> The road [was] bumpy here, smooth there. … I've learned a lot, as in leading, and being helped and sharing ideas with fellow teachers, that's really been amazing. ... working with Agness [co-facilitator] especially, it's always awesome, it's always good, she makes my job easy. … When she was helping me [in the workshop], I'd pretend as if I'm also a participant. (Abel)

The role of facilitators in fostering teacher motivation and attendance raises a wider issue, since leadership in many schools in sub-Saharan Africa is hierarchical rather than distributed (Harber & Mncube, 2012). Workshop leaders of professional learning may have little or no leverage over teachers' participation (Hennessy et al., 2015B). A related consideration is the role of headteachers with regard to attendance and possibly facilitation, which may intimidate classroom teachers. For example, in Kenya, headteachers teach (part-time), so would normally participate in the programme, and may be in a (pedagogical) leadership position already.

Characteristic 6: Teacher and Facilitator Motivation and Progression

Extensive programmes need to be locally owned to reach scale, and principals and teachers need to take responsibility for their professional development. Ideally, sbTPD becomes part of

the school culture, institutionalised through regular TGMs. On the policy side, this implies urgent action to motivate teachers (working in challenging settings) to engage. Meaningful TPD certification should be available. Teacher career progression and salary structure need to reflect achievement in TPD. Simply mandating attendance is not a strong motivator. Building collegiality and increased professionalisation developed through the programme provides motivation, reducing recourse to financial incentives. This resonates 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).

Likewise, facilitators should receive recognition and certification for their role. Lange (2014) noted that nearly half of all trained multipliers[8] left the programme schools in her study owing to limited chances for career development. This highlights the need for incentives to keep highly trained facilitators within the system of the intervention, and suggests that making teacher career progression dependent on participation in — and facilitation of — sbTPD is a useful strategy. In some countries, this may require raising the status of primary school teachers, which may be lower than for secondary teachers. The lead facilitator of our programme, Abel, has conducted a few workshops at other schools and for a Zambian non-governmental organisation but without official recognition of such endeavours, their reach and sustainability will be limited.

Often progression is through degree programmes that are not relevant to practice. Instead, teachers and facilitators could acquire degrees (or degree credits) through school-based activities, e.g., a 'Certificate in TPD facilitation', ultimately a requirement for becoming a headteacher.

Characteristic 7: Fidelity through 'Whole Programme Scaffolding'

Maintaining fidelity is another challenge in many kinds of TPD. Even within sbTPD, a degree of cascading (for example, in facilitator preparation) is inevitable to reach scale, and the real test of programmes lies in the ability to be delivered by new facilitators (Hill, Beisiegel, & Jacob, 2013). To manage dilution, and enable fidelity in the delivery by others, there should be a clear structure for what teachers will do during professional development workshops (Hardman et al., 2011) as well as in the classroom: the structure and content of workshops at all levels (including the school level) needs to be explicit.

The degree of prescription is a crucial element. Clearly teachers (as professionals) need the freedom to explore and make their own decisions, while maintaining effectiveness. Simply providing a repository with digital resources is not productive without sufficient guidance (including scaffolding and templates for logical instruction sequences; Hewlett Foundation, 2014). However, while there is some evidence that providing lesson plans can be effective (Nag et al., 2014), teachers also need the authority to tailor their own teaching to learner needs ('structured pedagogy' in the classroom, including carefully planned sequences of lessons with clear lesson objectives, formative assessment and a range of appropriate pedagogical approaches; Tikly, 2011; Timperley et al., 2007).

We propose scaffolding children's, teachers' and facilitators' actual experiences. This means not just offering materials, but holistic 'whole programme scaffolding' (see Figure 1). Such scaffolding includes sbTPD materials for facilitator/teacher use in TGMs, alongside linked classroom resources. Self-contained materials, with explicit programme structure, need to provide enough scaffolding to enable groups of teachers to implement the programme autonomously without dependence on ephemeral induction events. In other words, rather than thinking about what a national coach does (and supporting this through materials, such as slides for workshops), programmes should be designed by thinking about what the teacher does (both in sbTPD and in the classroom).

Teacher materials are supplemented with facilitator notes. This in turn is augmented with materials for national and regional coaches on how to run professional development for facilitators. If the focus of the programme is on what the teacher does (during sbTPD and in the classroom), then the focus for workshops should be an induction to sbTPD, i.e., modelling sbTPD as well as classroom trialling. In our conception, sbTPD induction workshops have the purpose of preparing facilitators and equipping them with reflective facilitation skills; rather than attempting to prepare 'key teachers' from whom other teachers learn by diffusion (not supported by evidence). Moving away from workshops following an overfull curriculum, seeking to transmit knowledge about interactive teaching (taught by rote), makes it possible for workshops to focus on 'process' and explicitly model quality educational practices, communicating the nature of sbTPD, and how to initiate sbTPD at the school. Misunderstandings arise frequently — both regarding classroom teaching (Hennessy et al., 2015A) and school-based TPD (Hennessy et al., 2015B). It is thus imperative to make practice at workshops as explicit as possible and focus on "what can be observed in the act of teaching (i.e., task, activity, classroom interaction, assessment) as key indicators of quality" (Hardman, 2015, p. 3).

OER4Schools offers balance: structured plans and specific materials for each two-hour TGM alongside scope for flexibility and adaptation to teachers' own purposes, settings and issues arising, including pointers to additional resources. This semi-structured nature at the school level, particularly the explicit provision of workshop plans, is a key factor in supporting fidelity: maintaining the original teacher learning intentions of the programme, as productive, mutual adaptations, with "a commitment to iterative, collaborative design" (Penuel et al., 2011, p. 332).
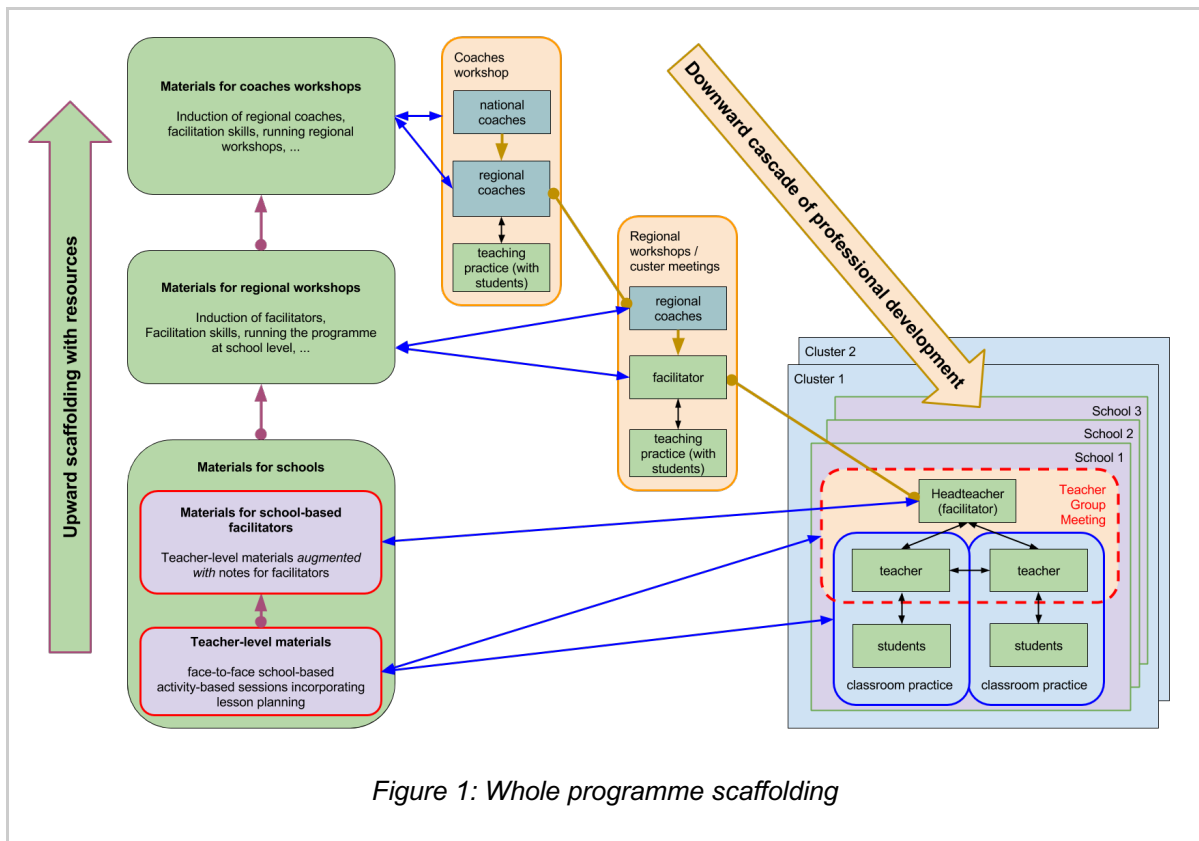
Figure 1: Whole programme scaffolding

Characteristic 8: Mitigating Resource Constraints through Open Access and OER

Explicit attention to cultural adaptation during programme design and implementation (including materials development) is necessary: sustainability and scalability depend on how closely approaches fit with existing practices, curricula and policies, and whether they offer appealing ways to address issues perceived by teachers and other education system stakeholders. It is therefore valuable to conduct small-scale studies to examine such factors, prior to large-scale trials.

However, this does not mean that materials have to be developed from scratch for each context, which is labour intensive and may result in low quality if resources are limited. Teachers' tolerance of minor cultural variation is quite high in our experience. We suggest that autonomous authoring of effective and culturally appropriate learning materials (by teachers or 'experts') is neither feasible, nor necessary. It appears sensible to focus on re-use and trials of existing materials. To this end, collaborative adaptation of OER works well, and constitutes an empowering, scalable and sustainable practice.

Our definition of 'open' draws on the three OER freedoms (Hassler & Mays, 2015): programme adaptation and sharing is possible because of shared ownership (legal barriers are removed, no rights clearance needed); the programme can be evaluated and used both online/mobile, offline and on paper (open access; multiple access paths); collaborative content creation and

adaptation is possible,[5] supporting participatory approaches, essential for developing a culture of inquiry.

OER support:

- Sustainability through offering resilience against change: resources can be adapted; resources created in time-limited donor-funded projects are available perpetually.

- Scalability: the cost of resource reproduction is low/free; production of new resources becomes more cost-effective since they build on existing resources.

- Increased ownership: all participants are permitted (and encouraged) to make changes.

- Equity: Resources developed for a project in one country become available elsewhere (for adaptation).

From a research perspective, openly available programme materials further contextualise research publications; with such materials (in relation to publications) constituting 'open data'. While it is accepted, sometimes mandated, that research outputs are available as 'open access' publications, this is not the same for programme resources.

In our case, openness also helps the organic and decentralised adoption of OER4Schools in new contexts. In early 2014, a teacher from Kenya adapted the programme for her country; activities were undertaken in Rwanda and Sierra Leone. In 2015 the OER4Schools methodology was adapted for the T-TEL programme in Ghana, and in 2016-17 some of the materials were used in an independent programme in Zambia. In 2017-18 the programme is being adapted for secondary school use in Zimbabwe.

Importantly, we are not advocating verbatim replication, but rather building on existing programmes as a starting point. While cultural adaptation is essential, it has to be recognised that content development never starts *in vacuo*, but in the context of existing resources and research evidence. Moreover, in the above cases, the initial adaptations — deemed by local educators to make the programme sufficiently appropriate — were what we might call 'surface adaptations', which included changing:

- place names and object names (e.g., 'traffic lights' vs. 'robots');

- images (of particular locations, such as for 'a trip to Victoria Falls' vs. 'a trip to the Maasai Mara'; images of classroom situations were not deemed to need adaptation);

- references to certain policies that differ between countries (e.g., pace grouping);

- digital technology-based activities (because different technologies are used).

The resulting version was judged to be sufficient for initial trials, informing subsequent deep adaptation where needed. We conjecture that such adaptations for new countries (e.g., in Kenya; for first use of the programme) are similar to further tailoring in other Zambian contexts. The process of initial surface adaptation followed by trials resonates with

participants' voices in the UNESCO Access2OER discussion (Hassler, 2009), expressing a preference for early access to raw materials and making their own judgements, rather than decisions about suitability/availability of materials being made by an external agent. Adaptable TPD resources may well be useful across different national contexts, despite different (colonial) histories and inherited education systems.

To date, the enormous investments in education have not produced a body of open (Creative Commons licensed) TPD materials, readily available for reuse. As far as we are aware, OER4Schools is the only open and structured teacher professional learning programme for SSA.[6] Indeed there was a curious absence of 'open' in the discussion of SDG4 (World Education Forum; UNESCO, 2015; however, see Lane, 2017).

It is clear that OER supports sustainability and scalability, with important implications for equity. TPD programmes and funders should take those advantages seriously, and embrace open approaches to development (Smith, 2013). Indeed, from our perspective it is hard to see how 'open' could not be an ingredient in scalable TPD models. Funders need to give clear guidelines to implementers regarding both release of materials as OER and building on existing OER.

Characteristic 9: Appropriate Use of Digital Technology in Programme Implementation

The potential for using technology for supporting TPD in LMICs is recognised (e.g., Power, 2014; Twining et al., 2013; for an evidence map, see Muyoya, Brugha & Hollow, 2016). Hardman et al. (2011) assert that supporting sbTPD through distance learning materials and school clusters has significant potential for closing the gap between theory and practice, and raising the quality of teaching and learning in SSA primary schools.

Infrastructure Constraints

In practice, there are often significant infrastructure obstacles in scaling digital technology, and we may ask: Is the intended usage of technology such that it can scale with existing facilities and infrastructure (available to the intended users), or are there unacknowledged assumptions that impede scaling? Unfounded assumptions are often made about levels of technology and Internet access in planning for new initiatives, and even where Internet-enabled phones are widely available, the cost of access can be prohibitive for many. Programmes cannot depend on expected infrastructure; experience shows that this leads to unexpected delays.

Making a TPD programme available online is often equated with 'global reach'. However, do online programmes reach the teachers entrusted with the care of the most disadvantaged and marginalised children?[7] They generally do not, and it is unlikely that they will do so any time soon.

Creative solutions appropriately exploit technology available to teachers. For example, in supplementing paper-based distance learning with text messaging (UNESCO, 2014, pp. 27-28), the available technology is used within the scope of its affordances (communication), while

static resources are delivered on paper. We caution that the all-in-one online delivery of (often closed) resources through MOOCs is counterproductive; offline delivery of static OER, combined with peer interaction through a MOOC or another social platform seems technologically more appropriate and scalable. Other constraints posing significant challenges to potential e-learners in low-income countries include language, computer literacy and cultural sensitivity: "In reality [online learning] may well be serving only the 'privileged' in developing countries who already have 'access' to digital technologies and international language learning" (Liyanagunawardena, Williams, & Adams, 2013, p. 5).

Technology Use Must be Effective (for teachers and children)

The choice of technology use, supporting pedagogy in a constructive way and leading to learning gains, is not a given: for instance, the introduction of computer laboratories in Brazilian schools had a negative impact on student performance, but teachers' use of the Internet as a pedagogical resource supported innovative classroom teaching and learning, resulting in improved test scores (UNESCO, 2014, p. 35). Technology use in OER4Schools did not include distance e-learning (online, self-study), but promoted (offline) face-to-face peer learning and collaborative exploration of interactive teaching (e.g., supporting TPD through video stimuli; mathematics learning through spreadsheet use). Technology use should extend rather than replace previous characteristics, and should not be equated with Internet use. The latter (and other digital communication, including MOOCs) can enhance face-to-face peer learning but should be tailored to the needs of the intended audience; it should serve the poor and marginalised without exacerbating digital divides further. Indeed, certain models of individualised teacher (online) e-learning in SSA may not be educationally effective nor equitable.

Equity and Value for Money

Technology procurement needs to offer the highest value for money. Individual e-learning is particularly intensive as it requires one device per pupil. Often technology-based programmes assume that 1:1 is educationally most effective. However there is no research evidence supporting this (Hassler, Major, Hennessy, 2015). Programmes take time to be rolled out (and may never reach everybody); 1:1 thus exacerbates inequity (Adam, 2015). An even more effective approach is technology use to support the TPD programme only, requiring one device, or a few devices, per school rather than, potentially, hundreds. Overall, a cautious approach is recommended to avoid educators and policymakers being swayed by the rhetoric surrounding new technology (Hassler et al., 2016; USAID, 2014).

Recommendations

> The problem facing governments and funders is how to upscale 'what works' in terms of higher student attainment more evenly at a national scale while recognising that the constraints of large classes and scarce resources are likely to remain the common experience for teachers and their students for some years yet, particularly with increasing numbers of students progressing to secondary school. (Westbrook et al. 2013, p. 64)

Drawing on our own and the wider research evidence, this commentary has considered the TPD choices that are available to tackle the problems outlined in the above quote. As stated in the Introduction, we do not claim that these have emerged from comprehensive rigorous research, as no such TPD research in SSA is available. However, our recommendations are grounded in theory and evidence from diverse contexts, and we believe that they offer a better chance of success than other approaches. While our own research on OER4Schools is small-scale owing to its intensive concentration on in-depth promotion and study of change, the programme is arguably at present the only *open TPD initiative* for LMICs that is *underpinned by a reasonable body of published research literature*. Moreover, our research outcomes resonate with — and further substantiate — those of previous studies, recent comprehensive literature reviews in SSA and TPD research elsewhere.

In order to meet the need for large-scale, systemic and ongoing development opportunities for teachers, *we recommend that programmes explicitly focus on scaling and sustaining, while maintaining effectiveness* — as opposed to leaving scaling and sustaining to a later programme phase. We have argued in this commentary that such a focus requires a specific pedagogical design. Based on our review of the literature and our own research, we conclude that the most educationally effective, sustainable and scalable models are likely to possess the following characteristics. They

1. ultimately *promote student learning;*

2. *promote teacher learning:*

   o comprise *whole school professional development* with a *focus on active teacher learning and modelling interactive pedagogy;*

   o foreground concrete and detailed (planning for) *classroom-based activities*;

   o support participants in learning from *observation and collaboration with peers;*

   o allow for *'seeing' and experiencing* (e.g., through video clips and live classroom practice), with an overall focus on increasing understanding of pedagogical practice, underpinned by theory;

3. support *peer-facilitated, school-based professional development;*

4. are *long-term and scheduled as regular teacher group meetings*, operating within a structured TPD timetable;

5. explicitly *support TPD leaders in organisation and facilitation* through induction and ongoing professional development;

6. appropriately *motivate teachers (working in challenging settings) to engage*, including attention to teacher career progression and salary structure;

7. are based on a coherent and comprehensive *'multi-level' set of resources*, tailored to *the national and/or local contexts*, with *activity-based workshop outlines*, plus *built-in support for facilitators ('whole programme scaffolding')*;

8. employ *Open Educational Resources,* increasing sustainability, scalability and equity;

9. *use technology equitably* for essential communication and in support of *face-to-face (offline) peer learning*.

We note that this list is (partially) aligned with the school improvement tradition (Hopkins, Stringfield, Harris, Stoll, & Mackay, 2014) as well as specific national insights (Ethiopia: Mitchell, 2015) and Leadership for Learning (Frost, 2014).

Conclusion

If the Sustainable Development Goals are to be met by 2030, especially under the conditions of constrained financing, then scalable, sustainable, effective models for teacher programme development and implementation are needed. This commentary has argued for the appropriateness of an effective, contemporary approach to TPD. We suggest that the evidence is secure enough to suggest a viable blueprint for educators and funders engaged in teacher education in LMICs, against which planned initiatives can be evaluated. There may be reasons for deviation, but these should be carefully argued and backed up by existing research evidence. In particular, this means that programmes intended for rollout need to be designed to be scalable from the outset.

In analogy with findings suggesting the inequity of private schooling, including resource differences between schools (Alcott & Rose, 2016), and in light of OER research in the USA, it appears to be an urgent matter of equity that the resources underpinning publicly funded educational programmes are open (OER) and made available in a timely fashion.

While there is a growing focus on systematic approaches to evaluating TPD in developed countries, more research is urgently needed in SSA — in particular regarding system-wide implementation in challenging conditions. For new large-scale programmes, this means that rigorous evaluation is essential (external, mixed methods, including experimental and quasi-experimental research designs), to add to the knowledge base. We hope that our work will stimulate such research and debate on open models of TPD.

Acknowledgements

Notes

1. SDG 4: "Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all", https://sustainabledevelopment.un.org/?menu=1300.

2. The full resource is available at www.oer4schools.org.

3. The South African videos were developed in collaboration with AIMSSEC, https://aimssec.aims.ac.za/.

4. Multipliers are teachers who receive training and are asked to return to their home school to pass on the content they have obtained to the other staff members (Lange, 2010).

5. OER4Schools uses MediaWiki for content co-creation.

6. There are two programmes that almost fit this category: The first author developed an open and structured tutor professional development programme in Ghana (see http://oer.t-tel.org), building on OER4Schools. The other programme is open, but intended for India: TESS-India (http://www.tess-india.edu.in/). In TESS-India the overall workshop structure is less apparent in some of the materials, but guidance for facilitating teacher meetings and workshops is available.

7. https://en.unesco.org/world-education-forum-2015/incheon-declaration.

8. https://www.educ.cam.ac.uk/centres/real/researchthemes/highereducation/mappingeducation/

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