

Technology-supported professional development for teachers: lessons from developing countries



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Education Development Trust Highbridge House, 16–18 Duke Street, Reading, Berkshire RG1 4RU
T +44 (0) 118 902 1000 E enquiries@educationdevelopmenttrust.com W www.educationdevelopmenttrust.com

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Welcome to Education Development Trust

At Education Development Trust, we have been improving education around the world for 50 years. We design and implement improvement programmes for school systems, and provide consultancy services deploying specialists internationally.

Our work is informed by our continually refreshed body of research which focuses on the bright spots in education, from education authorities as diverse as those in Vietnam, Kenya, England, New York and Dubai.

Bringing about real change that alters the aspects of a national system that, for many reasons, aren't working so well at the time, requires knowledge and ability to design and implement changes to any of the levers that can impede great educational outcomes. So the ability to affect policy, practices, pedagogy, behaviour, funding, attitudes and more is a prerequisite for a company that can truly claim to transform lives through improving education.

As highly informed agents of change operating in low- to high-income countries with their varying internal contexts, we not only design but also show and enable, so when working with us, everyone involved, from policymakers to school leaders and teachers, is able to apply their new knowledge to drive sustainable system reform.

Our expert knowledge, programme design and implementation expertise is also deployed in delivering Ofsted-rated outstanding careers services in England, and in owning and managing a family of independent schools.

We are a not-for-profit and we are driven by our values of integrity, accountability, excellence and collaboration.

About London Connected Learning Centre

London Connected Learning Centre (CLC), part of Education Development Trust, supports schools and other settings to make the best use of new technologies to drive school improvement. We have worked with London schools for 20 years putting creativity and real-world contexts at the heart of learning opportunities for young people, teachers and parents. We involve children and young people in using digital technologies to create, experiment, design and explore. Initially funded by the English Department for Education, London CLC has developed a programme of creative technology-based learning and education technology solutions. We foster collaboration between teachers, students and parents and we work in partnership with businesses (e.g. IBM), higher education (e.g. the Institute of Education, University College London) and community and cultural organisations (e.g. Tate and the British Film Institute).

About the authors

Tony McAleavy is Education Development Trust's Research and Development Director, with corporate oversight of the educational impact of all Education Development Trust's activities and the Education Development Trust public domain research programme. Tony has worked extensively on school reform in many countries, particularly in the Middle East. He has an MA in Modern History from St John's College, University of Oxford.

Alex Hall-Chen is an Education Analyst at Education Development Trust. Prior to joining Education Development Trust she worked in education and higher education policy. She is co-authoring a report on national approaches to helping schools use evidence, and has been conducting research into the characteristics of successful Multi Academy Trusts. She holds a Double First in Politics, Psychology and Sociology from the University of Cambridge.

Sarah Horrocks is Education Development Trust's Director at London CLC. In this role, she oversees a team of teachers, technicians and computer scientists to help schools design and deliver their computing curriculum, keep children safe online, install and maintain IT systems and ensure teachers, pupils and parents are confident and creative users of technology. Sarah is the co-author of Education Development Trust's study, Educational blogs and their effects on pupils' writing.

Dr Anna Riggall is Head of Research at Education Development Trust. She oversees the organisation's portfolio of international research and supports research activity across the business. She spent her early career teaching in Russia, southern Europe and the Caribbean and has worked as an educational researcher since the early 2000s. She holds an MA in Education and Development and a PhD in Education.

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Chapter 1

Introduction – professional learning, technology and the learning crisis



This report captures what might be learnt from a selection of the world's most interesting examples of technology-assisted in-service professional development in lower-income countries and from wider reflections about the potential of technology to enhance the professional learning of teachers.

Based on the lessons that emerged from the UN Millennium Development Goals and the Education for All movement 2000–2015, there is now a global consensus that universal school enrolment is necessary but not sufficient for children to learn. While more remains to be done regarding enrolment, attendance in itself is not enough. Children are also entitled to learn—and too often they learn very little when at school. UN Sustainable Development Goal 4, adopted in 2015, identifies the need to **ensure inclusive and equitable quality education**. Much remains to be done to achieve this goal. In many countries large numbers of children are failing to achieve basic literacy and numeracy standards despite being enrolled in formal education.

A recent UN Educational, Scientific and Cultural Organization (UNESCO) report on mobile phone technology and teacher professional learning emphasised the scale of the challenge.

Since 2000, school enrolments have indeed surged, but often at a cost of lowering standards for teachers and expanding class sizes, a situation which makes teaching—a demanding profession in any setting—even more challenging. The results have been dire: millions of young people are not reaching minimum learning standards despite being enrolled in formal education. UNESCO estimates that 1 in 5 of the world's approximately 650 million primary school students cannot read basic sentences or solve simple arithmetic problems after 4 years of classes.¹

The World Bank's *World Development Report 2018*² focuses on school education. The picture that emerges in this is similarly stark. The report describes the shockingly poor learning outcomes that students in many low- and middle-income countries achieve. The authors highlight 'the learning crisis' that much of the world is facing and illustrate this with examples of how little learning appears to be taking place in some schools.

In many countries large numbers of children are failing to achieve basic literacy and numeracy standards despite being enrolled in formal education

¹ Miao et al. (2017: 8) ² World Bank (2018)

Schooling is not the same as learning. In Kenya, Tanzania, and Uganda, when grade 3 students were asked recently to read a sentence such as 'The name of the dog is Puppy,' three-quarters did not understand what it said. In rural India, just under three-quarters of students in grade 3 could not solve a two-digit subtraction such as $46 - 17$, and by grade 5 half could still not do so.³

Having described the scale of 'the learning crisis', the World Development Report 2018 proposes a possible solution. One key component of this relates to the urgent need for action to make teachers more effective. In-service training for teachers in developing countries is too often ineffective. Improving teacher skill and motivation levels is a critical precondition for the achievement of better student learning. The report proceeds to strike a cautiously optimistic note: high-impact professional development can improve teaching and learning.

Is there hope for in-service training or professional development? Decidedly yes. Experience from high-income countries shows that practicality, specificity, and continuity are key to effective teacher professional development. Practicality means teachers are trained using concrete methods as opposed to theoretical constructs, and the training is classroom-based. Specificity means teacher training programs are most effective when they teach pedagogy specific to a subject area (say, how to effectively teach a mathematics class). Continuity means teachers receive significant continual support—not one-off workshops.⁴

Technology has huge potential to enhance professional development in line with this analysis, with its focus on **practicality, specificity and continuity**. Learning can be given a **practical** quality, through, for example, the sharing of cost-effective videos that show promising practice in authentic settings. Mobile technology makes a range of school-based learning possible, which we know to be more powerful than traditional off-site workshops. Purposeful reflection about **specific** subject-related pedagogy can be enhanced by giving teachers access to comprehensive digital resources related to particular aspects of the school curriculum. Technology can provide cost-effective ways of supporting coaching relationships and professional learning communities so that professional development takes place within a framework of **continuous** and sustained reflection.

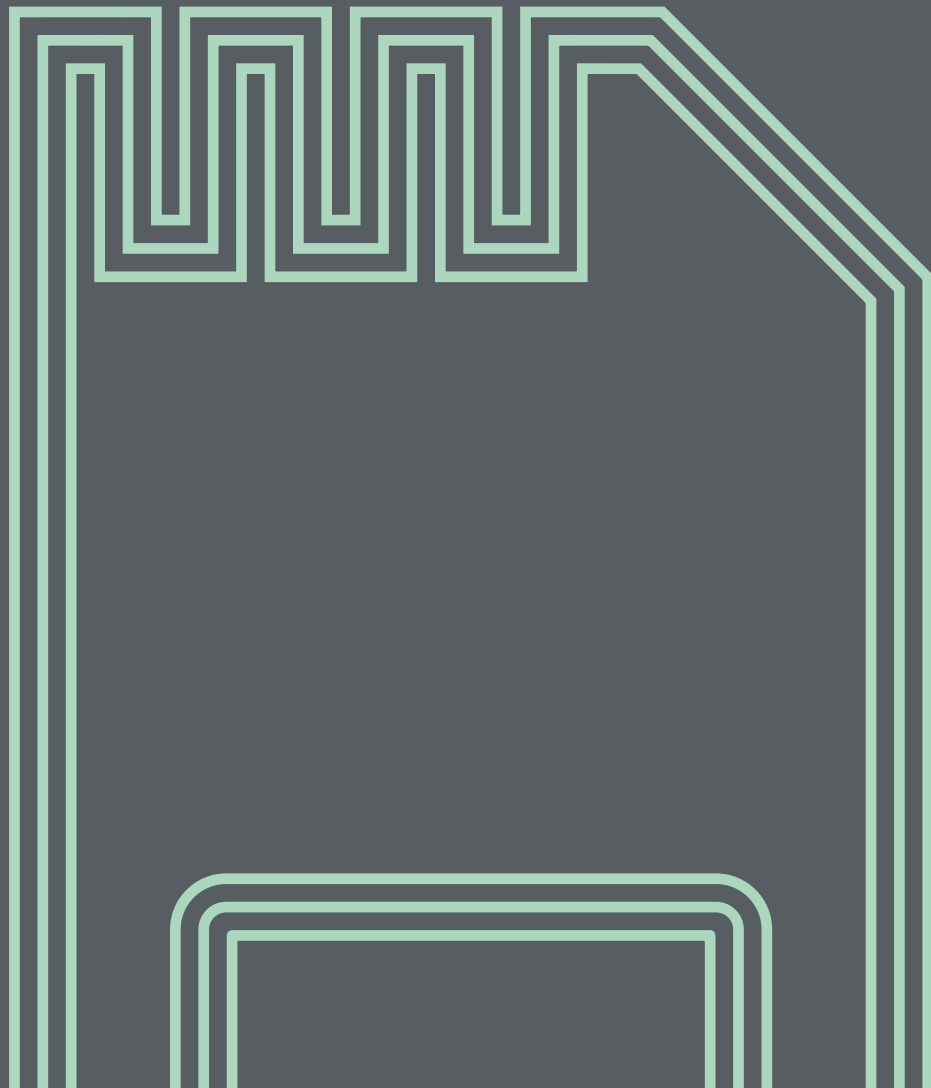
Improving teacher skill and motivation levels is a critical precondition for the achievement of better student learning

³World Bank (2018:3) ⁴Ibid. (132)



Chapter 2

Technology and its potential for supporting in-service teacher professional development



The research-informed consensus about effective teacher professional development says the use of technology for teacher professional development needs to be considered within the wider context of thinking about effective professional development.

Several synthesis studies have been produced of research into how teachers learn. Much of this literature is derived from research undertaken in high-income countries. Nevertheless, this body of research is an important starting point for reflections on the use of technology for professional learning. Here we summarise findings from three different synthesis studies of the characteristics of effective professional development: Timperley (2008), Cordingley et al. (2015) and Darling-Hammond, Hyler and Gardner (2017).

There is a high degree of overlap between the conclusions that arise from these surveys. Based on these three studies, we highlight ten characteristics of high-impact professional development:⁵

1. Classroom-based expert coaching relationships can provide good

opportunities for learning: Off-site workshops and cascade models of training are generally considered very weak mechanisms for changing teacher behaviour. School-based and classroom-focused coaching is much more likely to lead to change. Teachers require access to external expertise in order to be able to challenge existing assumptions and develop the kinds of new knowledge and skills required for improved outcomes for students.

2. Teachers need collaborative opportunities to process new professional

learning: Collaborative team-based professional learning is important but collegiality alone is not enough. Teachers need to participate in a professional learning community connected by a shared commitment to improve student outcomes.

3. Professional learning takes time: Too much professional development activity is relatively short term in nature. Change takes time to embed and the sustainability of change long term depends 'both on what happens during the professional learning experience and on the organizational conditions that are in place when external support is withdrawn'.⁶

We highlight ten characteristics of high-impact professional development

⁵ See Timperley (2008), Cordingley et al. (2015) and Darling-Hammond, Hyler and Gardner (2017) for further details ⁶ Timperley (2008: 24)

4. Approaches should be based on sound principles of adult learning: Teachers are likely to reject new ideas that conflict with their current ideas unless, as part of the professional learning, the conflict is explicitly addressed. Teachers usually need to try out new ideas many times in an environment of support and trust. Teachers (particularly those from schools facing challenging circumstances) may need help relating to their sense of efficacy: they need to believe better outcomes are possible for their students.

5. Teachers should be encouraged to adapt guidance principles to suit context: Teachers work in such varied contexts that there can be no guarantee that any specific approach to teaching will have the desired outcomes for students. Evidence-based practices should be promoted but professional development should also enable contextualisation by teachers to their particular teaching situations.

6. Teachers particularly benefit from subject-specific training opportunities: Professional development focused on generic pedagogic strategies is insufficient. Programmes that are focused on, for example, questioning skills or assessment for learning but that are not also rooted in developing subject-specific knowledge are not likely to achieve their potential.

7. Teachers benefit from exposure to models of effective practice: Teachers need to see what best practices look like. Models of effective practice can include the direct observation of expert classroom practice and access to other artefacts such as lesson plans and samples of high-quality student work.

8. Effective professional development recognises differences between individual teachers and their different starting points: In every country the teaching workforce will be heterogeneous. New teachers have needs that are different to those of veteran teachers; highly effective teachers and currently ineffective teachers both require professional development but manifestly they need different professional development.

9. School leaders have an important role to play in professional learning: The impact of professional development can be influenced by the extent to which school leaders encourage commitment to professional change, endorsing the messages discussed in training and managing the professional development process.

10. Teacher 'buy-in' is a key determinant of the success of professional development interventions: Teachers who perceive themselves as the passive recipients of training determined by others, especially if it appears to be based on a negative view of their current practice, are unlikely to derive much benefit from the training. Ideally teachers will see themselves as active participants able to choose resources and support relevant to their needs.

An important question that needs to be raised concerns the extent to which the principles of effective professional development found in the high-income country literature apply in the context of developing countries.

Most commentators on teacher professional development in developing countries, while recognising huge contextual differences, advocate a broadly similar model

Evidence-based practices should be promoted but professional development should also enable contextualisation by teachers to their particular teaching situations

of interventions to that proposed by researchers in high-income countries. This model emphasises in-school learning, coaching, collaboration, subject focus and sustained reflection over time.

Such a model is promoted in the *World Bank's World Development Report 2018*, for example.⁷ The authors recommend that any off-site training workshops have school-based follow-up visits that allow trainers to observe and support teachers in the classroom. They cite evidence from India and from African countries suggesting that long-term teacher mentoring and coaching can result in 'sizable learning effects'.⁸ The report describes enthusiastically how teachers in Shanghai, China—where students have done very well in the Programme for International Student Assessment (PISA)—participate in peer evaluation based on classroom observation.

The Inter-Agency Network for Education in Emergencies (INEE) promoted a similar view in some detail in 2015, in one of the most helpful recent reports of the potential of teacher professional development in low-income and fragile states.⁹ The INEE guidance is based not on a conventional literature review but on consensus that had emerged from an extended online expert symposium, which was then calibrated against the findings of the academic literature. This important paper in effect endorses the model of high-impact professional development interventions described in the literature derived from studies in high-income countries:

*In many parts of the globe, nations, districts and schools are beginning to move away from poor professional development practices...toward what we know is effective professional development – school-based teacher learning, differentiated teacher professional development, greater school-based support for teachers and teacher collaboration. This has happened mainly in wealthy and non-fragile countries, but increasingly, it is also occurring in low-income and fragile contexts.*¹⁰

Burns and Lawrie, and their colleagues, provide an optimistic, practical account of ways in which useful professional development can be provided and enhanced in low-income countries and fragile states. The advice is based on seven key recommendations, one of which highlights the role of technology:¹¹

- 1. Focus** on teachers as professionals, learners and individuals.
- 2. Develop, apply, measure and institutionalise** standards for teacher professional development.
- 3. Create** professional development opportunities that promote teacher collaboration.
- 4. Provide** teachers with ongoing support.
- 5. Invest** in high-quality teacher educators.
- 6. Build** instructional leadership at all levels of the educational system.
- 7. Use** information and communication technology (ICT) to provide access to content, professional development and professional learning communities.

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⁷World Bank (2018) ⁸Ibid. (132) ⁹Burns and Lawrie (2015) ¹⁰Ibid. (8) ¹¹Ibid.

While we must recognise the potential of effective training, it is important also to understand the limitations. Even the best professional development cannot solve all the problems that beset school education in many developing countries.

Harnessing the power of technology to support professional learning

There are obvious links between the principles of effective teacher development identified in the international literature and the potential application of technology. Professional development, mediated by technology, can engage teachers directly and circumvents the often-cited weaknesses of off-site workshops and the indirect cascade model. Face-to-face coaching models are effective but expensive; technology offers the possibility of much more cost-effective distance models of coaching. The three synthesis studies of teacher development¹² all stress the desirability of social and collaborative learning among peers. Technology offers the possibility of collaboration among communities of teachers who are dispersed geographically. The studies argue for peer learning, enhanced by external expert inputs. Again, technology has the potential to connect distant experts with both face-to-face and virtual learning communities of peers. The literature describes the need for teachers to see effective practice but often there are no models of effectiveness immediately at hand; again, technology can be used to provide access to videos of authentic examples of high quality.

US researchers Polly and Hannafin systematically analyse the scope for technology to enhance teachers' professional learning.¹³ They point out that teachers are most likely to adopt new pedagogical approaches promoted in training when they feel a sense of ownership over their learning because they have some scope to select content and activities. Online professional development study programmes have been found to promote teacher ownership of their learning, as participants can be given scope to choose the focus of their learning, and undertake tasks at times that are chosen by them. Polly and Hannafin highlight the power of video to provide models of effective pedagogies, as they bring concrete models of classroom practice and increase the likelihood that teachers will adopt new approaches. They stress the desirability of collaborative learning and identify the promise provided by online communities of practice.

Several other authors highlight the particular potential of video technologies to enable teachers to reflect on their practice and to derive practical insights by observing the practice of others. Roth¹⁴ suggests that the value of utilising video in this context lies partly in the fact that it gives teachers a chance to reflect on their practice in a manner that is detached from the emotional involvement that features during and immediately after the lesson. Furthermore, Marsh and Mitchell¹⁵ emphasise the ability of video recordings of teachers' lessons to capture complex information about teacher performance that would prove difficult to convey through verbal representation, and to present a strong stimulus for group discussion and reflection. This builds on Borko et al's¹⁶ study into mathematics teachers' professional development, which finds that the use of video recording

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¹² Timperley (2008), Cordingley et al. (2015) and Darling-Hammond, Hyley and Gardner (2017) ¹³ Polly and Hannafin (2010) ¹⁴ Roth (2007) ¹⁵ Marsh and Mitchell (2014) ¹⁶ Borko et al. (2008)

not only situates the professional development firmly within the teachers' own experiences but also engenders increasingly more in-depth and analytical collaborative discussion among teachers regarding effective pedagogy.

Technology and the power of collaboration

Studies of effective professional development repeatedly emphasise the power of collaboration and often promote the idea of a professional learning community. The internet presents an opportunity to enable the more effective implementation of the principles of communities of practice in teacher professional development. As Tsai¹⁷ notes, theorists have for some time recognised the importance of creating communities of practice beyond the boundaries of the school, but the need to travel places unrealistic demands on teachers' time. By negating the need to travel, improved network technologies can enable the development of online communities of practice to be effectively incorporated into teacher professional development.

The potential of technology to improve teaching quality in low-income countries

The case for better in-service training in developing countries is compelling. A major push factor encouraging the development of technology-assisted teacher professional development in low-income countries is the shortage of the skilled teachers needed to extend universal access to quality education;¹⁸ both recruitment and the upskilling of current teachers are essential to achieving quality universal education. In response to these pressures, technology-assisted professional development constitutes a means to improve the skills of both established and newly trained teachers in places where the quality and quantity of teachers are insufficient.

The need for innovative solutions to improve education in conflict and crisis situations presents another push factor. While most research on the use of education technology in crisis settings has focused on technology in classrooms,¹⁹ the limited resources available and the acute need to upskill teachers in such contexts increases the potential utility of technology-assisted teacher professional development.²⁰

Writing from a development perspective, the contributors to the INEE paper authored by Burns and Lawrie²¹ were strongly convinced about the particular relevance of technology-enabled professional learning in even the most challenging situations.

Information and Communications Technologies can enhance the teacher-learning opportunity by offering multiple opportunities to practice new skills, apply new knowledge and gain access to new digital resources for classroom teaching. ICT (such as video) allows teachers to observe good practice – especially relevant in areas where diverse examples of teaching and learning

A major push factor encouraging the development of technology-assisted teacher professional development in low-income countries is the shortage of the skilled teachers needed to extend universal access to quality education

¹⁷ Tsai (2012) ¹⁸ UNESCO Institute for Statistics (2016) ¹⁹ Tauson and Stannard (2018) ²⁰ Mendenhall (2017) ²¹ Burns and Lawrie (2015)



*are in short supply. ICT can make models of effective teaching available to teachers through audio or video.*²²

An important dimension to technology-assisted professional development is its geographical reach and its potential to be accessed by teachers in remote areas. For example, mobile phone network coverage is rapidly expanding in most low-income countries, extending into communities that are difficult to reach via traditional face-to-face professional development. In addition to enabling teachers in remote regions access to professional development, the increasingly dynamic nature of the technology available holds the potential to connect teachers in such regions with a wider professional community that would otherwise be impossible for them to access.

Another driver of the growth in technology-assisted professional development is the issue of value for money. Whereas traditional professional development in the form of exclusively face-to-face training sessions is expensive as a result of the costs of the resource-intensive training and the time and travel needed for teachers to travel to the courses, technology-assisted professional development can be far more cost-effective. This is clearly the case where programmes utilise mobile phones that teachers already own and are familiar with. The expansion of mobile phone ownership in low-income countries presents an opportunity to train millions of educators at a relatively low cost.²³ Furthermore, as Gaible and Burns²⁴ note, rapid developments in technology mean that costs are continually falling while their robustness and versatility increase, making them suitable for use in low-income and infrastructure-scarce environments.

Well-designed and implemented coaching has been shown to be an effective form of professional development for teachers²⁵ but the costs involved in sending well-trained and experienced coaches into schools to support teachers can be prohibitive. Several projects have begun to explore the use of ICT to make the provision of coaching more cost-effective, such as through the use of virtual coaching networks. Although such interventions have mostly been concentrated in well-resourced education systems, they suggest that research into ways to use technology to improve coaching in low- and middle-income countries could be valuable. For example, a project in Brazil that used Skype to reduce the costs of coaching for teachers led to cost-effective impacts on student outcomes compared with other forms of professional development.²⁶

Technology-assisted professional development offers flexibility. A common theme in feedback from teachers undertaking professional development is that the time demands of their work are such that they struggle to fully utilise the training they receive. While this to an extent reflects a systemic issue that needs to be addressed through a cultural shift in the profession, technology can go some way to mitigating it by enabling teachers to access training at a time and place that suits them. This is particularly powerful, as Miao et al²⁷ note, in low-income countries where teachers often hold multiple jobs.

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²² Burns and Lawrie (2015: 132) ²³ Miao et al. (2017) ²⁴ Gaible and Burns (2005) ²⁵ Bruns, Costa and Cunha (2017); Kraft, Blazar and Hogan (2016); Piper and Zuilkowski (2015)
²⁶ Bruns, Costa and Cunha (2017) ²⁷ Miao et al. (2017)

Massive Open Online Courses and Open Educational Resources

The Commonwealth Secretariat institution, the Commonwealth of Learning (COL),²⁸ has for many years provided global thought leadership to all interested in the power of distance learning to help teachers in developing countries. In recent years COL has highlighted the power of technology-enabled distance learning. Given the large numbers of unqualified and minimally trained teachers in many low-income and fragile states there is clearly potential for Massive Open Online Courses (MOOCs) and other forms of online distance learning. On behalf of COL, Perraton²⁹ highlights the value of such online learning to upskill large numbers of existing teachers in developing countries. At the same time there is a need to recognise that some of the early hopes for MOOCs have not been fulfilled and that, across many sectors, MOOCs often have very low completion rates.

Perraton distinguishes between different audiences: teachers with minimal or no pre-service qualifications and suitably qualified teachers who require additional training are very different groups, but both can benefit from targeted online training. Perraton also argues that online learning has many potential benefits in a development context: the cost-effective distribution of teaching materials; supporting successful two-way communication between course participants and tutors; creating a learning community among students; and the downloading and use of Open Educational Resources (OERs).

OERs are not only freely available for downloading; they are also free from copyright restrictions, so teachers can modify materials to suit their own circumstances. OER4Schools in Zambia was a pioneering programme that ran from 2009 to 2015 and was intended to explore the applicability of OER in schools with large classes and a shortage of instructional materials. Haßler et al.³⁰ and Hennessey et al.³¹ have documented and evaluated different phases of the project. Teachers' engagement with the OER was relatively highly structured and involved, among other things, 25 two-hour online sessions, organised in five units, covering interactive teaching principles. The studies indicate that participating teachers were more likely to use engaging pedagogical techniques after participation in the programme.

Given the large numbers of unqualified and minimally trained teachers in many low-income and fragile states there is clearly potential for Massive Open Online Courses (MOOCs) and other forms of online distance learning

The promise of social media

Researchers have in recent years begun to analyse the potential role of social media in teacher professional development. Writing from a UK perspective, McCulloch et al.³² posit that social media presents an opportunity for teachers to take ownership of their professional development and for learning to be sustained by peer coaching more successfully than in traditional professional development. They also emphasise the ability of social media to facilitate cross-school working and collaboration beyond geographically based local networks, and for activities such as blogging to support reflective practice.

Although this report comes from a high-income context, a British Council study of teachers across six South Asian countries published in 2015³³ also reveals a high

²⁸ See <http://thecommonwealth.org/commonwealth-learning> for details ²⁹ Perraton (2010) ³⁰ Haßler, Hennessey and Cross (2014) ³¹ Hennessey, Haßler and Hofmann (2015) ³² McCulloch et al. (2011) ³³ British Council (2015)

degree of engagement by teachers with social media. The study found that 64% of teachers across the six countries made regular use of Facebook, often through their mobile phones. This was the most popular social media platform but other platforms, such as WhatsApp, were also widely used. Encouragingly, a quarter of the teachers across the six countries who used social media reported that they were already using this technology to participate in professional interest groups with other teachers.

The importance of a blended approach

In 2013 Mary Burns documented an interesting experiment in Indonesia.³⁴ Identical professional development content was delivered to primary school teachers in either an entirely online mode or different versions of a 'blended' mode, with combined online and face-to-face components. There was a high dropout rate in the exclusively online group and no dropout at all in the blended routes.

*Course designers developed three variations of a web-based programme – a fully online, hybrid and web-facilitated model – and placed 20 learners, all with similar technology skills, in the three different models. The online cohort experienced a 31% attrition rate while 100% of learners in the hybrid and web-facilitated models completed the programme. Data collection revealed that the greatest factor impacting attrition or persistence was the absence or presence of face-to-face interaction with the instructor and colleagues.*³⁵

This study from Indonesia is consistent with the view that exclusively digital learning is less likely to be successful than professional development with some element of face-to-face engagement. This contention is supported by the findings on learners participating in exclusively online MOOCs, for which many studies have indicated very poor completion rates.

Burns and Lawrie³⁶ reinforce the case for blended learning in the context of low-income and fragile states. Teachers ideally need blended learning:

*ICT is a complement, not a sole solution. What it cannot do is replace professional face-to-face contact, instil quality where none exists or solve the human and institutional issues that bedevil fragile contexts.*³⁷

The concept of 'flipped learning' takes thinking about blended learning a stage further. Flipped learning has largely been discussed in the context of student learning but is clearly relevant also to adult professional learning. Face-to-face training or coaching sessions can be enhanced, in a particularly cost-effective way, if school teachers are able to engage with digital resources before the live sessions.

Particularly promising technologies

Much interest has been shown in recent years in the possibilities that mobile phones provide as a tool for teacher professional development in developing countries.

Encouragingly, a quarter of the teachers across the six countries who used social media reported that they were already using this technology to participate in professional interest groups with other teachers

³⁴ Burns (2013) ³⁵ Ibid. (141) ³⁶ Burns and Lawrie (2015) ³⁷ Ibid. (132)

UNESCO has promoted mobile learning for teachers over many years. In 2012 UNESCO in partnership with Nokia published a series of five regional studies describing ways phones were being used to support teachers in Latin America, North America, Europe, Africa and the Middle East, and Asia.³⁸ This series also includes a report by West,³⁹ which provides a global overview of mobile learning for teachers. For West the use of phones is situated in a context of global crisis in teacher recruitment and teacher development. The report highlights the particular potential of smartphones in two key areas: mentoring relationships that are informed by the sharing of video footage of practice and participation in formal and informal online professional learning communities.

UNESCO has continued its advocacy of mobile learning. In 2017 the organisation published a major study of teacher development enabled by mobile technology in four countries.⁴⁰ This report is the basis for one of the case studies presented later in this report. Miao and his colleagues make the case for a focus on mobile phones in the context of teacher development, identifying five headline reasons why mobile technology is so promising:⁴¹

Why mobile phones?

1. Many teachers in developing countries already have them.
2. A mobile device offers an interface and functionality that is understandable to most teachers and other non-technical users.
3. Mobile networks now cover large areas of the world.
4. Mobile phones are dynamic communication devices.
5. Mobile phones can facilitate 'anytime and anywhere' learning.

Other organisations support the focus on mobile phones. The British Council report mentioned earlier⁴² presents the results of a survey of school teachers of English across six South Asian countries: Afghanistan, Bangladesh, India, Nepal, Pakistan and Sri Lanka. The report describes a situation of widespread access to mobile phones and frequent use of mobile internet among this group of teachers. The majority of teachers in the study had phones with mobile internet connectivity and they used them prolifically. The teachers were much more familiar with mobile phones than with personal computers. It is interesting to note that teachers in Nepal reported the highest levels of engagement with their mobiles, with, for example, 77% of teachers reporting that they accessed Facebook on their phones.⁴³

The teachers in the British Council survey of South Asia had broadly positive views of the potential of their phones for professional development.

Among the respondents, there is a clear positive sentiment associated with using mobile applications as a medium for English language learning and other forms of continuing professional development. The teachers reported that mobile can be an effective medium to a) access learning and teaching material on demand, b) interact with experts and other teachers and c) be part of a social community with common CPD [continuing professional development] goals (e.g. through the use of social media).⁴⁴

In 2017 the organisation [UNESCO] published a major study of teacher development enabled by mobile technology in four countries

³⁸ UNESCO (2012a; 2012b; 2012c; 2012d; 2012e) ³⁹West (2012) ⁴⁰Miao et al. (2017) ⁴¹Ibid. (8–9) ⁴²British Council (2015) ⁴³Ibid. (16) ⁴⁴Ibid. (14)

The motivational power of SMS texting

Two studies from Sub-Saharan Africa hint at the way mobile phones can be used for engagement purposes through texting linked to a wider professional development programme.

During 2012–2013 a pilot project took place in Ghana that involved the sending of regular SMS texts to 175 leaders who had previously take part in a substantial programme of face-to-face leadership training.⁴⁵ This was part of the Leadership for Learning (LfL) programme, which was a collaborative research and development programme that took place in Ghana between 2009 and 2015. The project was designed by the University of Cambridge Faculty of Education. The SMS messages were based on the key principles of LfL and were intended to reinforce the understanding and engagement of the recipients. A qualitative internal evaluation suggested that school leaders found the messages extremely helpful as a way of maintaining momentum for change.⁴⁶

In Malawi in 2016 RTI International made imaginative use of mobile texting as a way of seeking to provide teachers with guidance and encouragement in between formal, face-to-face training or coaching sessions. This intervention was part of a much more substantial programme known as the Malawi Early Grade Reading Activity, which ran from 2013 to 2016.⁴⁷ The intervention was organised as a very small-scale Randomised Control Trial (RCT) experiment: some participating teachers received supportive text messages between face-to-face sessions while a matched control group did not receive the messages and simply received the face-to-face support. The SMS messages consisted of pedagogical reminders, classroom management tips, reminders about use of reading materials, training concepts and regular motivational messages. The participating teachers were tested for their understanding of content covered in training. The results showed modest but statistically significant score increases for the 'SMS group', with the teachers in that group better able to retain the information presented at the zonal training. The intervention was extremely cost-effective. A six-week campaign of sending 9,000 messages in total to 500 teachers cost in total just \$743.⁴⁸

In Malawi in 2016 RTI International made imaginative use of mobile texting as a way of seeking to provide teachers with guidance and encouragement in between formal, face-to-face training or coaching sessions

An authoritative overview of promising technology

Burns and Lawrie's⁴⁹ work contains a chapter devoted to the use of technology for teacher professional learning in low-income and fragile states, authored by Lawrie, Hennessy, Hassler and Phalachandra. This text is an important contribution to the literature on the use of technology for teacher learning in developing countries and provides a rare and extremely well-informed overview of the topic. Lawrie and his colleagues set out some overarching principles about the use of technology and then highlight eight promising technologies that have particular potential in low-income and fragile contexts.

The overarching principles include an assertion of the importance of a blended approach, where technology is used as part of a wider intervention that must

⁴⁵ Swaffield, Jull and Ampah-Mensah (2013) ⁴⁶ Swaffield, Jull and Ampah-Mensah (2013) ⁴⁷ Kipp (2017) ⁴⁸ Ibid. ⁴⁹ Lawrie et al., (2015)

involve face-to-face components. The report also urges policy-makers not to have unrealistic expectations about the power of technology to tackle deep, systemic problems.

The eight promising technologies that can contribute to powerful professional learning for teachers in low-income and fragile states are as follows:

1. Audio learning (interactive radio instruction and audio learning for teachers):

The guidance reminds readers that some older technologies have strong evidence of impact. In particular, it highlights the power of interactive radio and pre-recorded audio content. There is clearly a danger that the emphasis today on mobile phones will overshadow the value of other older technology, such as radio.

2. Video (camcorder, camera and smartphone filming): Technological developments have made the creation of inexpensive film of classroom practice much easier. Such material offers interesting opportunities for personal and peer-to-peer reflection on teaching performance. Video has the potential to provide teachers with exemplars of good pedagogical practice in authentic contexts.

3. OER and other digital materials via tablet, smartphone, laptop (audio, video, visual, text): OER can provide teachers with a great wealth of materials for self-study and collaborative peer reflection. It can be used either online or offline.

4. Computerised student testing: Providing repeated 'real-time' information about student academic performance, through online testing, is potentially a powerful way of demonstrating to teachers the impact of new pedagogical approaches: 'If teachers in fragile settings could receive objective information/data on their own teaching performance over a period of time, then this could further enable them to take control of their own learning and increase their own likelihood of achieving quality standards.'⁵⁰

5. Computers in schools/ICT centres: There is very little evidence to suggest that IT rooms in schools—where there is a concentration of school computers—have a positive impact on student outcomes. However, these IT rooms represent an under-utilised resource in terms of teacher professional learning through downloading materials, online coaching relationships, social media, online forums and participation in online courses.

6. Mobile phones: As yet there is still little conclusive proof of impact but mobile phones have much promise. They are 'cost effective, portable, easy to operate, and many offer web browsing'.⁵¹ As technology develops further the value of mobile phones for professional learning is likely to increase.

7. Online communication (for coaching): Platforms such as Skype provide scope for inexpensive virtual coaching, although currently this depends upon a reliable internet connection, which excludes many teachers in remote and low-income settings.

8. Serious gaming: One intervention that has potential but has been almost entirely ignored is the concept of the serious computer game. Such games could be used to explore professional challenges in a particularly engaging way.

There is very little evidence to suggest that IT rooms in schools—where there is a concentration of school computers—have a positive impact on student outcomes

⁵⁰Lawrie et al. (2015:138) ⁵¹Ibid. (139)

Lessons from failure: technical, institutional and attitudinal barriers to success

While there are grounds for optimism about the role of technology in teacher development it is also important to learn from projects that fail or are only partially successful.

Boitshwarelo⁵² describes an experiment in the use of online collaborative learning for secondary science teachers in the context of Botswana. This intervention was not successful. The participants were initially enthusiastic but technical problems and pressure of work led to the collapse of an embryonic virtual community of practice.

Failures such as this can be instructive—and there are many reasons why technology-enabled interventions in schools sometimes fail. The causes of failure, as in the Botswanan example, can include resourcing problems, institutional factors and attitudinal issues.

Many technical issues can undermine the application of technology. The potential return on investment in technology can be greatly reduced if hardware is not properly maintained. Connectivity problems make online learning difficult in many low-income countries. Onguko⁵³ highlights the gap that exists between ‘western’ realities and the conditions found in many developing countries:

*Definitions of blended learning from the Western perspective are influenced by realities of the context in the western countries. Such realities include: abundant access to electricity on the grid, uninterrupted and cheap Internet connectivity, and access to powerful technologies such as computers and tablets. Thus for scholars from the West, it is quite in order to emphasize access to online experience when defining blended learning.*⁵⁴

As Miao and colleagues pointed out in 2017,⁵⁵ even the much-vaunted advantages of mobile phones often prove elusive in practice because of technical problems:

*Not all teachers knew how to use mobile technology; mobile networks were less reliable than initially assumed; getting teachers to actively engage with new services was often a struggle; paying for teachers to access specific mobile content was logistically and technically complex; operating systems and other technical specifications varied enormously; and mobile technology changed so quickly that educational services developed for hardware that was relevant when a project began were not as relevant when the project ended.*⁵⁶

Although mobile technologies have the potential to extend dramatically the reach of teacher professional development programmes in low-income countries, owing to the rapid proliferation of mobile and computer technology, it is important to note that ownership of such technologies is far from ubiquitous. Ownership—and the infrastructure needed for usability—remains concentrated in urban areas, which can pose significant limitations to the reach of projects seeking to improve professional development in rural areas. While some projects have overcome ownership issues by providing teachers with mobiles, signal and wider

Connectivity problems make online learning difficult in many low-income countries

⁵² Botishwarelo (2009) ⁵³ Onguko (2014) ⁵⁴ Ibid. (78) ⁵⁵ Miao et al. (2017) ⁵⁶ Ibid. (9–10)

infrastructural issues have been noted to be significant barriers to participation; teachers in such situations report feelings of frustration, which can lead to disengagement with the projects.⁵⁷

Institutional and attitudinal barriers can also reduce the effectiveness of technology-enhanced professional learning. Thang et al.⁵⁸ summarise some of the characteristic barriers to the successful implementation of technology-assisted teacher professional development in their analysis of the barriers that hindered attempts to create online collaborative learning environments for teachers during the Malaysian Smart Schools Initiative.⁵⁹

Thang identify some of the difficulties involved in the establishment of a viable virtual community of practice among a small group of teachers using an approach supported by online communications.

*It is apparent from the findings that teachers involved in the study faced several barriers in adopting the online tools...The 20 teachers in this study were definitely not ready for it...These teachers constantly have to juggle with teaching responsibilities, administrative work and co-curricular duties. On top of that, they have to worry about their students not performing well in public examinations. Thus, it was not surprising that the teachers lacked interest and motivation to experiment with new methods of teaching.*⁶⁰

The problem here was related not so much to the reliability or appropriateness of the technology but to the human factor. The teachers were not confident about the use of the technology. There was a fundamental misalignment between the model of better teaching promoted via the training and teacher perceptions of the teaching styles needed for students to do well in tests. The teachers also lacked the support of and endorsement from school leaders. The online community of practice gave teachers opportunities to comment on the practice of others. Some teachers were reluctant to provide developmental feedback.

*Besides these, culturally-related attitudes seemed to have hindered the extent of technology use too. Malaysians generally do not want to be seen as disrespectful to others, which is culturally regarded as 'saving face'. Thus, making comments that may seem to cause one to lose credibility in the eyes of others ('losing face') is avoided.*⁶¹

Even when the technology is available and reliable, changing teacher behaviours remains difficult. Schweisfurth⁶² provides a meta-analysis of research into interventions intended to bring about more engaging pedagogy in economically developing countries. She points out the difficulty of bringing about new teaching styles and the complexity of change in professional behaviour:

*Teachers' attitudes and practice are...shaped by multiple complex factors ranging from their cultural contexts, their own learning experiences, pre- and in-service training, and on-the-job experiences. Where teacher meets change, we find a number of barriers, including the speed and complexity of the change, and the strategies used to support and monitor the process.*⁶³

Even when the technology is available and reliable, changing teacher behaviours remains difficult

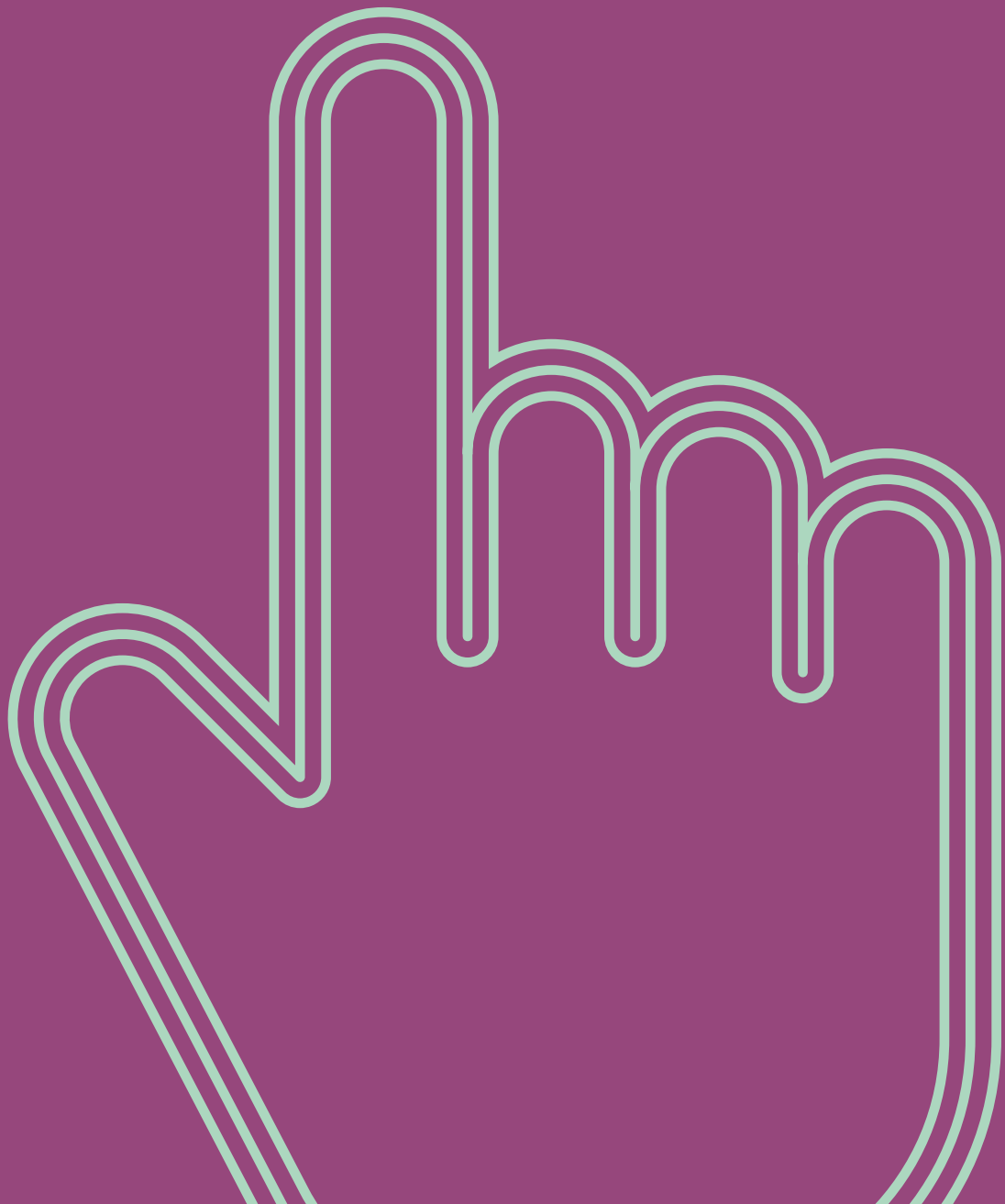
⁵⁷ Ibid. ⁵⁸ Thang et al. (2010) ⁵⁹ The Malaysian Smart Schools Initiative was a project initiated in 1997 to raise educational standards by integrating ICT throughout Malaysian schools. Low utilisation of the technologies as a result of difficulties in engaging teachers and improving their technological literacy led the Ministry of Education to introduce the e-CPDeT Vision 2020 project, which aimed to improve teachers' ICT skills and create communities of practice through online professional development. ⁶⁰ Thang et al. (2010:412) ⁶¹ Ibid. (411) ⁶² Schweisfurth (2011) ⁶³ Ibid. (427)

Designers of programmes of technology-enabled professional development need to consider both how technology might be utilised to improve teacher performance and how teachers can be supported and incentivised to make the best of the enhanced learning opportunities. A risk analysis is required to reduce the possibility of failure. Risks requiring mitigation in any technology-enabled professional development approach will almost always involve:

- potential technical problems
- alignment with other initiatives
- endorsement by school leadership and other influential people
- workload issues
- ensuring teacher 'buy-in'.

Chapter 3

Six promising case studies



Case study 1: UNESCO projects in Pakistan and Nigeria – using mobile phones to deliver pedagogical content to early-grade and primary school teachers.

Background

The challenge of achieving the UN's fourth Sustainable Development Goal to 'ensure inclusive and equitable quality education and promote lifelong learning opportunities for all' led UNESCO to explore the use of mobile technologies to support teacher professional development in low- and middle-income countries. The projects sought to address the twin challenges of teacher quality and teacher recruitment, which are characteristic problems in low-income countries—particularly in Sub-Saharan Africa. The aim was to demonstrate that the use of mobile phones for teacher professional development was scalable and sustainable.

The programme involved projects in four countries: Mexico, Nigeria, Pakistan and Senegal. They were overseen by UNESCO between 2012 and 2014 and then handed to local partners for the following two years. For the purposes of this report we focus on the projects in Nigeria and Pakistan, owing to the promising results they produced and the potential insights they offer into different geographical contexts.

The aim was to demonstrate that the use of mobile phones for teacher professional development was scalable and sustainable

How did the projects use technology?

In seeking to improve teacher quality in low-resource environments, UNESCO piloted the use of mobile technologies in national teacher professional development systems in order to help in-service primary school teachers who had limited access to professional development.

The rationale for using mobile phones was that the rapid expansion in mobile phone ownership in low- and middle-income countries would enable the project to extend to educators beyond the reach of traditional professional development programmes; that they offered a familiar user interface that does not require advanced technical expertise to employ; that mobile phone network coverage was expanding to areas not served by fixed-line internet connections; that they were dynamic devices that facilitate two-way engagement; and that they could facilitate flexible learning to suit teachers' schedules.

The aim of the project in Nigeria was to develop the pedagogical practices of primary school English language teachers to improve student outcomes in English language and literacy. To this end, UNESCO worked with 50 teachers in 50 different primary schools in the Federal Capital Territory of Nigeria. Participating teachers received training at the outset of the project, at which they were given Nokia

handsets with pre-paid SIM cards and taught how to access and navigate the mobile learning service. The teachers were divided into five groups, each of which was overseen by a teacher trainer who provided ongoing support. The groups met regularly to discuss implementation of the pedagogical advice and to create a professional learning community.

The content was delivered in the form of short daily messages of 50–100 words and an image, sent to participants over a 52-week period, and was designed to cover content relating to the British Council’s 30-hour Certificate in Primary English Language course. The content was designed to build more complex knowledge over time and covered child language acquisition, production and use of resources for primary-age pupils and monitoring pupil progress. The data fees for the recipient were minimal and did not exceed one US\$1 a month.

The project in Pakistan aimed to improve the knowledge and pedagogical practices of female Early Childhood Education (ECE) teachers working in rural areas, and involved 150 teachers in 75 schools in four different areas of Pakistan. Participants were given a free Nokia mobile and a SIM card with six months of free internet connectivity and credits for text messaging and phone calls, which they used to interact with each other and ask questions. The teachers each received three days of training on how to use the mobile phones and access the content.

An early education training manual was developed for use on mobile phones with small screens, based on existing learning materials for the National Curriculum for ECE. Content included an introduction to ECE; effective implementation of ECE; key areas of learning; and effective assessment of ECE. Twenty videos on ECE were also produced, including of lectures and practical classroom demonstrations, which also presented multiple choice questions designed to engage the teachers and assess their understanding of the content. The videos were hosted in a cloud library and downloaded to teachers’ phones. A Facebook page was created to facilitate communication between the participants and wider stakeholders.

Participants were given a free Nokia mobile and a SIM card with six months of free internet connectivity and credits for text messaging and phone calls, which they used to interact with each other and ask questions

What impact did the projects have?

The projects were evaluated⁶⁴ through a collaboration between independent evaluators, UNESCO and Nokia. A mix of quantitative and qualitative were used: surveys with Likert-scale and open-ended questions; statistics measuring the technology use by participants gathered through anonymous usage tracking; and participant questionnaires given near the start and end of the interventions. The analyses sought to understand participants’ perceptions of the impact of the interventions and of changes in ICT skills; the frequency of ICT use; attitudes towards using ICT for teaching and learning; and pedagogical knowledge and practices.

The participants’ feedback from the project in Nigeria was positive: it had reportedly improved their English language skills and increased their use of ICT for teaching purposes substantially. The project had also led to the creation of communities of practice among the teachers. Participants reported an increase in the frequency of contact with other teachers using mobile phones, and a decrease

⁶⁴ Miao et al. (2017)

in feelings of isolation over the course of the intervention. The quantitative data collected showed that teachers regularly accessed the content, as did around 70,000 people outside of the pilot group, suggesting that, without major financial investments, the project could be scaled up to reach more teachers.

The teacher feedback also suggested a preference for messages that contained direct ideas for classroom practice, as opposed to more abstract pedagogical information, as well as for open-ended messages that encouraged reflection. Issues around connectivity in some cases hampered teachers' ability to access the content. Such connectivity issues presented a barrier to access for teachers in more rural areas in particular.

The feedback from participants of the project in Pakistan was also largely positive, with teachers reporting improved pedagogical and technical skills and changes in their teaching practice, including greater use of activity-based learning. They also reported improved relationships with other teachers, parents and pupils and greater knowledge-sharing among colleagues. In terms of mobile phone use, almost all teachers showed a positive change in their use of mobile phones for accessing educational content, and the overall participation rate among the teachers was high. There was consistent engagement from teachers in all regions with the closed 'right or wrong' questions asked through the Mobilink text messaging platform, with 78% of answers being correct.

However, although most teachers reported improved student motivation, reports of impact on student outcomes were lower than anticipated. As with the project in Nigeria, mobile and internet connectivity issues hampered teachers' access to the content, although the active engagement of participants throughout the project suggests this did not compromise its overall viability.

The overall evaluation of the projects found that teachers were broadly enthusiastic about using mobile phones to improve their professional capacities, and that their ICT skills had improved substantially throughout the projects. Although changes in pedagogical knowledge were not formally tested, the participant feedback indicated an increase in subject knowledge as a result of the interventions. The organisers noted that the projects were most effective when they used technology to provide teachers with well-organised, sequenced content and resources that reflected a clear learning pathway. They concluded that technology was best used for teacher professional development to supplement other types of training, not to replace it, and that technology-based interventions 'need to be embedded in carefully planned projects that extend well beyond technology and encompass training, partnerships, content development and financing'.⁶⁵

Overall, the evaluations suggested that these projects had successfully used technology to support hard-to-reach teachers to access materials that engendered positive pedagogical changes and improved learner outcomes. The projects do, however, raise issues around the extent to which connectivity issues can hamper project impact; although mobile networks have vastly improved in recent years, their reliability in some areas of low-income countries means that care must be taken in project design.

Evaluations suggested that these projects had successfully used technology to support hard-to-reach teachers to access materials that engendered positive pedagogical changes and improved learner outcomes

⁶⁵ Miao et al. (2017:65)



Case study 2: English in Action, Bangladesh – using mobile phones and SD cards to deliver content to teachers.

Background

English in Action (EIA) was a professional development project that sought to leverage the potential of mobile phones to deliver innovative school-based learning for English Language teachers in Bangladesh. The aim was to encourage English teachers to make their classroom practices more communicative and thus improve the English language competencies of Bangladeshi pupils. Sue Williamson, Team Leader at EIA, and Claire Hedges, Senior EIA Programme Manager, told us that the broad objectives were to stimulate economic growth in Bangladesh and improve the population's English language communication skills.

The project ran from 2008 to 2017 and was delivered by a partnership of the Government of Bangladesh, BMB MacDonald, The Open University and BBC Media Action.

SD cards provided teachers with hundreds of audio-visual and text-based resources, both for classroom teaching and for professional development

How did the project use technology?

During its pilot phase, EIA provided teachers with multimedia resources loaded on Apple iPods with portable, rechargeable speakers, with teachers given training on how to use the devices and resources. When the project was upscaled, however, budgetary constraints led to the development of the 'trainer in your pocket' kit, consisting of the low-cost Nokia C1-01 mobile phone, a portable rechargeable Lane amplifier and all of the resources on 4GB micro Secure Digital (SD) cards.

The SD cards provided teachers with hundreds of audio-visual and text-based resources, both for classroom teaching and for professional development. This technology was chosen as it was low-cost, portable, readily accessible and available offline, as well as enabling more choice in when, where and how teachers accessed their professional development. It also benefited from the growth in mobile phone ownership in Bangladesh: although relatively few people in Bangladesh have a landline telephone connection, mobile phone networks have developed rapidly and ownership of simple mobile handsets has grown exponentially.⁶⁶

The media materials accessible on the SD cards included:

- audio materials to bring spoken English into the classroom, such as songs, rhymes, dialogue and interactive audio developed around pronunciation or vocabulary points, which could be played on mobile phones to the class through the battery-powered portable speaker

⁶⁶ GMSA Intelligence (2014)

- English language audio material for teachers to improve their own English and provide the necessary language for the classroom to ask questions and give instructions
- audio and video teacher training materials, including teachers' own reflections on the teaching experience and authentic video examples of teachers working in real classrooms.

These technology-enhanced teaching materials were developed by the Open University in partnership with Bangladeshi teacher educators. The project provided an eight-module course of in-service teacher training with teachers over a sixteen-month period, which included modules focusing on listening, reading, speaking and writing. Each module had its own training workshop (led by a trained facilitator who was also a practising teacher) and teachers were provided with accompanying print materials, including EIA-produced primary and secondary teacher guides. These made extensive use of the audio materials and video clips available on the phone, which used a narrator to explain different Communicative Language Teaching pedagogies and then showed examples of the pedagogies in practice. All materials and classroom resources were linked to the national curriculum and the national textbook for English language teaching, *English for Today*, making it easy for teachers to incorporate the activities and practices into their lessons. Ongoing support was provided through paired teachers in schools, head teachers and regular locally based meetings of teachers.

EIA was therefore closely aligned with identified strategies for maximising the benefits of teacher professional development training. It prioritised school-based, staff-led training, advocated for on-the-job training through classroom-based coaching and mentoring, and established communities of practice within the school for staff with a shared professional learning focus.

A series of internal evaluations found that EIA had had a substantial impact on classroom practices when measured against baseline evaluations

What impact did the project have?

In terms of scale and reach, by 2017 EIA had reached 232 *upazilas* (a sub-unit of a district in Bangladesh) and involved 51,000 teachers and seven million students.⁶⁷

A series of internal evaluations found that EIA had had a substantial impact on classroom practices when measured against baseline evaluations. A 2011 report⁶⁸ on the impact of the project on classroom practices found that 88% of student speaking time in both primary and secondary schools was conducted in English, and these levels remained broadly consistent in evaluations of later phases of the project.^{69,70} This was in marked contrast with the findings of the baseline evaluations, which noted few opportunities for students to use English in lessons (2–4% of lesson time).⁷¹

These studies also showed an increase in teachers' use of English in classrooms: the 2011 evaluation found that primary school teachers used English 71% of the time, and again this level remained consistent in later phases of EIA. During the baseline study, 67% of lessons involved teachers speaking more Bangla than English.

⁶⁷ English in Action (no date) ⁶⁸ English in Action (2001a) ⁶⁹ Erling, Burton and McCormick (2012) ⁷⁰ Woodward et al. (2014) ⁷¹ English in Action (2009a)

Qualitative evidence⁷² also suggested a marked improvement in classroom practices and student learning outcomes:

- 98% of primary and secondary teachers reported that English in Action had improved their English
- 98% of primary teachers and 94% of secondary teachers reported using more pair and group work
- 93% of primary teachers and 100% of secondary teachers reported that changes in teaching had improved student motivation
- 91% of primary teachers and 86% of secondary teachers reported that changes in teaching had had a positive impact on student learning.

The impact of EIA on students' and teachers' English language skills was also evaluated, using the Trinity Graded Examinations in Spoken English. At the launch of the pilot, Trinity College London assessors used questionnaires to assess 543 teachers' (367 primary; 176 secondary) and 7,239 students' (4,630 primary and 2,609 secondary) English language skills against the criteria of the 12-point Trinity College English Language scale. They found that student attainment was low and progression minimal, and that many teachers' English skills were lower than the level they were expected to teach.⁷³

A year later researchers assessed 785 primary and 317 secondary students from the pilot cohort. The proportion of primary students failing to pass the examination had fallen from 64.3% to 49.9%, and the proportion of secondary school students failing to pass from 28.9% to 10.4%, suggesting that the aforementioned pedagogical changes had had notable positive effects on students' English language skills.⁷⁴ This study was replicated in 2013⁷⁵ for the second cohort of EIA participants; its results also showed significant improvements in student and teacher attainment compared with the 2010 baseline, notwithstanding a six-fold increase in the project's scale.

Evaluations of EIA thus suggest that it was successful in using low-cost technology to deliver high-quality professional development to large numbers of teachers.

Evaluations of EIA suggest that it was successful in using low-cost technology to deliver high-quality professional development to large numbers of teachers

⁷²English in Action (2011b) ⁷³McCormick, Eyres and Burton (2012) ⁷⁴Ibid. ⁷⁵Eyres et al. (2014)

Case study 3: Teacher Education in Sub-Saharan Africa (TESSA) – OER to support interactive teaching practices.

Background

TESSA is a network of teachers across Sub-Saharan Africa, drawn together by a shared bank of curriculum-based OER designed to improve the quality of teaching across the region by encouraging teachers to adopt inclusive, interactive pedagogic approaches to pupil learning. Demand for more engaging teaching methods has been increasing across Sub-Saharan Africa, and TESSA has played a part in the move towards more engaging pedagogies.

The project began in 2005 and is coordinated by the Open University in the UK, and has three aims:

- 1. To create** a network of African universities, working in partnership with the Open University and other international stakeholders, to tackle the professional development needs of teachers in Sub-Saharan Africa
- 2. To support** the development of school-based modes of professional development for teachers
- 3. To design** and build a bank of multilingual and flexible OER freely available to teachers in the region.

TESSA was a pioneer of the OER movement and is Africa's biggest teacher education collaborative initiative. It is used not only by individual teachers but also as part of a variety of pre-service teacher training programmes. Its main focus, however, is on un- and under-qualified teachers already working in schools: teacher supply issues make replacing such teachers unrealistic, which means efforts to improve quality need to emphasise professional development for existing teachers.

TESSA was a pioneer of the OER movement and is Africa's biggest teacher education collaborative initiative

How did the project use technology?

The TESSA community, including staff from the Open University and over 100 African academics, harnessed the potential of the internet and OER to collaboratively create a large bank of teacher education materials, with particular attention to the core areas of literacy, numeracy and science. These resources are free for all to access and adapt, under a creative commons licence, and are available on a specially designed website with pages for each participating country. All documents are accessible in PDF format, allowing the materials to be printed off for those without internet.

The materials model active pedagogy and all the study units are based on classroom activities focused on improving practice, so as to bridge the theory/practice divide. By including methodology as well as content, and providing the resources and tools for activity-based learning, the initiative aims to avoid the pitfall of presenting abstract theories that can alienate practitioners by placing the onus on them to find ways to operationalise the theory.

Key to TESSA's approach is its flexibility: the resources are conceptually strong yet designed to allow for customisation, to ensure contextual relevance across cultural and linguistic boundaries. It is this flexibility that has enabled their use in such a large range of contexts and programmes. Indeed, materials are available in four languages—English, French, Arabic and Kiswahili. TESSA thus represents a bottom-up approach to teacher professional development: teachers are encouraged to use the tools in ways that meet local needs, and its use of technology means teachers can access and implement the professional development in their school environments. Technology is key to enabling this adaptability: the digital nature of the resources enables easy modification.

Key to TESSA's approach is its flexibility: the resources are conceptually strong yet designed to allow for customisation, to ensure contextual relevance across cultural and linguistic boundaries

What impact did the project have?

Harley and Barasa⁷⁶ conducted a formative study into the impact of TESSA and concluded that it had succeeded in achieving its aims at scale.

In terms of take-up of the materials, they found that by 2012 TESSA OER had been used in a wide range of programmes, with almost 300,000 enrolments of teacher-learners and in-service teachers in all partner institutions. Importantly, TESSA materials were being used in a large variety of contexts, which suggested they had succeeded in their design aims of being flexible and easily reproducible. This was evidenced by their use in all core curriculum areas, in a variety of national policy contexts, in a range of pre- and in-service teacher training programmes, and in both contact and distance teacher training programmes. For example, TESSA materials were being used for the training of school inspectors, head teachers, professional teachers and unqualified as well as volunteer teachers in Ghana. This was aided by the fact that the TESSA networks spread far beyond the original TESSA consortium partners: diverse and complex networks of institutions had emerged that challenged traditional conceptions of education reform being spread from the centre to the periphery.

In assessing the impact of TESSA materials on teachers' practices, the authors concluded that:

*'TESSA has had significant impact on the identity and practices of teacher educators and a profound impact on those of teacher-learners. It has fused theory and practice; shifted perceptions from teacher as a "know it all" to "teacher as facilitator of learning"; and greatly enhanced the relevance of pupils' learning experiences.'*⁷⁷

While TESSA materials were being used in a variety of different ways and contexts, the authors noted that the use of the materials generally aligned with best practice

⁷⁶ Harley and Barasa (2012) ⁷⁷ Ibid. (8)

as identified by dominant academic theory. TESSA's success, they argued, owed to its ability to make more engaging pedagogies achievable by foregrounding the tools for activity-based learning and not alienating practitioners with a focus on educational theory. It was also noted that TESSA networks aided the development of communities of teacher education practice.

The authors did, however, raise concerns about the sustainability of the usage of TESSA materials in programmes where individual staff responsible for integrating them left, particularly where the materials were not formally written into course curricula. The project was also hindered by a lack of ICT infrastructure in places: even though teachers could be given materials on CDs or in print where this was the case, they were less able to select the materials to fit their teaching needs, and it limited their engagement with the materials to adoption, rather than adaptation, to local contexts.

On the whole, the evidence suggests that TESSA provides a blueprint for a low-cost, scalable intervention to provide effective teacher professional development.



TESSA networks
aided the
development of
communities of
teacher education
practice

Case study 4: Teacher Education through School-based Support in India (TESS-India) – OER to support the adoption of more engaging pedagogies.

Background

TESS-India was developed in light of the TESSA project and aims to improve teacher education in India through the provision of free and adaptable OER containing activities, case studies and reflection prompts for teachers. As with TESSA, it seeks to support the adoption of more engaging, inclusive teaching in regions where more limited pedagogies have hitherto dominated education systems.

The project was initiated at the behest of the Indian government to help address the issue of teacher quality. The country's rapidly rising learner numbers, coupled with poor learning gains for many, had led the federal government to recognise the critical need for changes in classroom practice and to target primary and secondary school teacher training, both pre-service and in-service.

Freda Wolfenden, academic director for TESS-India, described the approach to teacher professional development taken by TESS-India:

Our theory of change is that it is necessary to work across the levels within the education system in each state, changing the practices of both teachers and teacher educators. The tools for change are a set of open resources (OER) which offer activities, case studies and reflection prompts for educators.

The project, which has been in operation since 2012, is funded by UKAid and led by Save the Children India and the Open University.

The country's rapidly rising learner numbers, coupled with poor learning gains for many, had led the federal government to recognise the critical need for changes in classroom practice and to target primary and secondary school teacher training

How did the project use technology?

TESS-India employed TESSA's approach of using online platforms to enable the development, distribution and adaptation of text-based OER materials for teacher education and self-study, and also sought to use technology to enable wider dissemination of the materials. The OER are freely available online through the TESS-India website, interactive learning platforms, YouTube videos and Facebook, as well as offline on DVDs, memory sticks and micro SD cards, enabling access anywhere on teachers' own mobile devices. This accessibility is aided by the fact that the materials are specifically adapted for small screen use.

In Madhya Pradesh, for example, the government funded the provision of 240,000 SD cards, one for every teacher in the state's primary schools. Low-cost tablets

were used to support the localisation of the OER in each state, enabling the educators involved to have easy access to the OER and to become familiar with them before and during the localisation process. The tablet is also a tool for facilitating classroom-focused mentoring: teacher educators use the tablets to video and photograph the teachers to provide stimuli for subsequent mentoring discussions.

The OER were produced as the result of collaboration between UK and Indian education experts and policy-makers, and focus on the use of student-friendly pedagogies in Language and Literacy, Science, Mathematics and English. Each unit of study contains case studies, readings, reflective tasks and opportunities to apply and refine these practices in the classroom. A key feature of the materials is that they are complemented by videos of Indian teachers using the pedagogic methods in their classroom settings, thus providing learners with authentic examples of how they can be applied in practice.

In addition to professional development materials for classroom teachers, TESS-India created a set of text and video content specifically aimed at school leaders, with the aim of encouraging a whole-school approach to transforming teaching and learning.

As with TESSA, TESS-India materials are designed to be flexible and to support existing educational frameworks and curricula. They can be used both by individual teachers for self-study purposes and by teacher educators in a range of teacher training settings for pre- and in-service teachers. Their digital nature also allows them to be adapted to suit the needs of local education contexts; for example, states have translated content into three varieties of Hindi, as well as Odia, Kannada, Assamese and Bengali, and individual schools and teachers can further adapt these materials to suit institutional or local needs. The result is widely distributed origination and ownership of the OER and a built-in capacity for adaptation to meet local needs.

The project recognised that teachers do not work in isolation, and that, in order to maximise impact, it needed to engage teacher educators. To support teacher educators in becoming familiar with the TESS-India OER, its pedagogic approach and how the materials could be used in their work with teachers, a blended learning MOOC was created that was accessible through a variety of devices. After a pilot iteration, this was run in English (with approximately 10,000 participants) and then in Hindi (with approximately 30,000 participants), and both versions had a completion rate of approximately 50%.⁷⁸

Freda Wolfenden told us:

Technology has enabled us to reach large numbers of teachers and teacher educators at low cost, to enable a greater emphasis on teaching and learning in classroom mentoring of teachers and to facilitate networks and communities of teachers and teacher educators who are not geographically co-located. The openness of the OER enabled us to create multiple versions of the resources at low cost and to position the resources as a toolkit which can be integrated with other resources in programmes of study (the OER have been integrated into

The OER were produced as the result of collaboration between UK and Indian education experts and policy-makers, and focus on the use of student-friendly pedagogies in Language and Literacy, Science, Mathematics and English

⁷⁸ Wolfenden, Cross and Henry (2017)

the Diploma of Elementary Education for example) as well as, most critically, empowering teachers in the use of more participatory pedagogy i.e. adapting the OER to the specific learning needs of their students.

The project aims to further develop its technological offer through the development of new tools, including an app to enable teachers to plan and log their professional journey with TESS-India, in addition to exploring expansion of the TESS-India model to ECE.

What impact is the project having?

In terms of reach, more than 800,000 educators have accessed TESS-India, through a variety of means, including formally accredited courses, locally organised teacher education inputs, self-study and direct access from the web or offline from SD cards.⁷⁹

A detailed, programme-wide data analysis of impact has yet to take place but a major programme review in February 2017⁸⁰ indicated that teachers were using TESS-India OER to inform their lesson planning and subsequent teaching, and that the practices being developed were shared among peers at district level. Specifically, the review found that teachers had awareness and acceptance of the principles in the TESS-India key resources and that these were the main driver of classroom pedagogic change towards a more participatory approach.

Outcomes identified by the review included examples of better motivated teachers, better teacher–pupil relations, better structured lessons and the use of a wider range of local teaching and learning materials, including materials created by teachers and children. However, the review also noted that innovation in practice and the overall transformation in pedagogy were still in the early stages and that evidence was highly emergent.⁸¹

Furthermore, the TESS-India materials were found to contribute to the development of teachers' confidence with digital tools, including for professional learning; to increase familiarity with a range of different websites to enhance classroom teaching and learning practice; and to facilitate teachers' use of social media (such as WhatsApp) to share examples of practice and peer learning.⁸²

As with TESSA, therefore, the emerging evidence from TESS-India suggests that it provides a low-cost, flexible and effective form of professional development that is able to reach a large number of teachers.

TESS-India materials were found to contribute to the development of teachers' confidence with digital tools, including for professional learning

Using technology to increase the impact of traditional forms of professional development

The following case studies involve technology being used to increase the impact of traditional forms of professional development; projects have used technology to supplement, rather than supplant, conventional teacher training and thus represent an alternative perspective on the potential for technology to assist in the delivery of teacher professional development.

⁷⁹ Wolfenden, Henry and Cross (2017) ⁸⁰ Wolfenden (2017) ⁸¹ Ibid. ⁸² Ibid.

Case study 5: Teachers for Teachers, Kenya – using mobile technology to strengthen teacher development in Kakuma Refugee Camp.

Background

The Teachers for Teachers project in Kakuma Refugee Camp in Kenya was developed with the aim of responding to the gap in support for teachers in refugee and crisis-affected contexts. The importance of high-quality education in such contexts, combined with the extraordinary difficulties teachers face, make the provision of professional development and support especially vital.

Kakuma Refugee Camp is one of the world's largest, and 35.7% of children at primary level and 95% of children at secondary level are out of school.⁸³ Teacher training has been extremely limited—only 31% of teachers in the camp have received any pre-service teacher training—and professional development on the job is even rarer. A combination of low pay, high workloads and minimal training and support has engendered a high rate of teacher dropout, exacerbating the situation.

In response to this need, Teachers for Teachers piloted a professional development initiative for teachers in Kakuma Refugee Camp that integrated teacher training and peer coaching with mobile mentoring. The project ran between 2016 and 2017 and was delivered through a collaboration between Columbia University, the UN High Commissioner for Refugees, Lutheran World Foundation, and Finn Church Aid.

Kakuma Refugee Camp is one of the world's largest, and 35.7% of children at primary level and 95% of children at secondary level are out of school

How did the project use technology?

The project sought to use technology as one component of its approach to supporting teachers' professional development. The model involved either short- or long-term training in the form of interactive workshops, which were led by international and local staff and drew on local expertise. This face-to-face training was integrated with peer coaching and mobile mentoring in order to create both local and global communities of practice for the participant teachers.

The primary role of mobile technology in the project was therefore to provide teachers with support and expertise that geographical limitations would otherwise prevent them from accessing. After participants completed the initial training, they were assigned a 'global mentor' who provided them with online support alongside a small group of refugee teachers for a six-month period. The mentors' role was to connect teachers in groups of four to five through WhatsApp and Facebook, which they then used to facilitate discussions on good practice and provide advice on

⁸³ Mendenhall (2017)

issues participants were facing in the classroom. The technology used enabled the mentors and teachers to share videos and images as well as text, thus widening the scope of the ideas and solutions discussed.

The mentors further reinforced learning from the in-person training by giving teachers pedagogical advice linked to the training through a mobile mentoring curriculum. All the participants from each training cohort—numbering around 30—were also linked via a larger WhatsApp group to enable them to share and exchange ideas with a wider audience. This structure also enabled the mentors to connect and discuss strategies to aid their mentees.

Participating teachers were provided with mobile phones and data, thus removing the main financial and technical barriers to communication that would have limited the impact of the project had teachers been asked to use their own technology.

The project thus created an environment in which teachers could build communities of practice, collaborate and design solutions to the issues of working in an environment fraught with difficulties.

What impact did the project have?

The Teachers for Teachers project was able to achieve a broad reach throughout the camp: 130 teachers were trained, with this including representation from 20 of the camp's 21 primary schools, and over 33,000 students were taught by teachers undertaking the professional development.⁸⁴

Measuring the impact on classroom practice was a difficult undertaking, owing to the complexity of the context it was operating in. Monitoring students' results, for example, was found to add too great a burden on the already overstretched teachers. The impact of the project was therefore assessed primarily through teacher-generated data: participants submitted pre- and post-training questionnaires that sought to identify changes in teachers' skills, knowledge and classroom practice in relation to the core competencies included in the training. The resultant data was complemented by data collected by peer coaches in the form of logs of Teacher Learning Circles and observation forms from classroom visits.

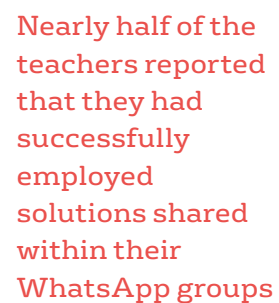
The project team also analysed the teachers' WhatsApp and Facebook activities in order to extract qualitative and quantitative data relating to the frequency and type of communication between the teachers and their mentors. In addition, they held focus groups and interviews with the aim of collecting narratives from teachers and students using the Most Significant Change technique.

The various methods used to assess impact suggested considerable success: the teacher-generated data reported increased preparation, confidence and pedagogical knowledge among teachers, which had led to a marked improvement in teaching effectiveness. Notably, teachers reported improvements in their non-academic roles with regard to child protection and positive discipline. This is of particular value in the refugee context where the creation of safe learning environments is vital.

Teacher-generated data reported increased preparation, confidence and pedagogical knowledge among teachers, which had led to a marked improvement in teaching effectiveness

⁸⁴ Mendenhall (2017)

Whilst these findings indicate that the project as a whole had a positive impact on teaching practice, further evidence suggested that the technological aspect of the programme was particularly successful. Nearly half of the teachers reported that they had successfully employed solutions shared within their WhatsApp groups, suggesting that the communities of practice created through mobile technology had led directly to improved pedagogical practice. Furthermore, project organisers reported evidence that participants continued to share resources through the structures set up by the project after direct support from the project had ended. This implies not only that the approach presents an opportunity for self-sustaining teacher professional development but also that the approach could easily be adapted and implemented in other crisis-affected contexts at a relatively low cost, given that the intervention was based on open-source materials.



Nearly half of the teachers reported that they had successfully employed solutions shared within their WhatsApp groups

Case study 6: National Tablets Programme, Kenya – improving the coaching provided to teachers.

Background

The National Tablets Programme was introduced by the Kenyan Ministry of Education (MoE) to improve the support offered by coaches to teachers implementing a new literacy initiative in Grades 1–3. The project was piloted with 70 users as part of the Primary Math and Reading (PRIMR) initiative in 2013, and expanded to all of Kenya's 1,100 curriculum support officers (CSOs) and 70 instructional coaches working in low-cost private schools in 2015 as a key aspect of the delivery of the MoE's Tusome Early Grade Reading Activity. The CSOs provide coaching in the government schools; both CSOs and 'instructional coaches' are referred to here collectively as 'coaches'.

Previous research indicated that ICT interventions in the education systems of low-income countries had had mixed results, with relatively few showing statistically significant impacts on student outcomes.⁸⁵ However, a PRIMR RCT conducted into the effectiveness of using ICT at different levels of the Kenyan education system found that assisting coaches to support teachers was a cost-effective use of ICT.⁸⁶ The National Tablets Programme therefore aims to use ICT specifically to improve the efficiency and extend the reach of coaching.

The National Tablets Programme aims to use ICT specifically to improve the efficiency and extend the reach of coaching

How did the project use technology?

The National Tablets Programme presents a different approach to the use of technology in teacher professional development to the projects discussed thus far, in that the technology is used to improve the practice of coaches providing the professional development rather than to provide training directly to teachers.

The coaches support teachers in the delivery of the new literacy programme, and the tablets are intended to improve the effectiveness of the support the coaches provide. Each coach receives a tablet loaded with software that enables them to record the results of their teacher observations and provide feedback to teachers.

The software includes four resources to generate instructional feedback on teachers' implementation of Tusome. The first is Tangerine:Tutor, a classroom observational tool with embedded lesson plans designed specifically for the Tusome programme. The data from the observations, along with measurements taken of randomly selected pupils' reading fluency rates, is collected and analysed by Tangerine:Tutor, which subsequently suggests points for emphasis for the coach to use in their feedback. Tangerine:Tutor also saves the feedback, enabling the coach to refer to the data and suggestions on future visits.

The tablets also contain PDF versions of all Tusome-designed books and materials, enabling coaches to compare their observations of classroom practice with

⁸⁵ Piper et al. (2017) ⁸⁶ Piper (2016); Piper et al. (2016)



suggested practice in the teachers' guides. The third resource is a set of 30 instructional videos in English and Kiswahili providing visual examples of model teaching practice, many of which have embedded quizzes for the coaches to administer to check that teachers understand the content. Tangerine:Tutor suggests videos for the coach to show based on the aforementioned analysis of observations and the student fluency measure. The fourth tool is Papaya, a letter-sound practice tool that aims to address teachers' difficulties with differences in letter pronunciation between English and Kiswahili. Where observational data identifies consistent issues with letter-sound pronunciation, Tangerine:Tutor suggests the use of Papaya.

An additional benefit of the programme is that data from the coaches' use of the tablets is provided to county- and national-level education leaders in order to improve accountability, which has hitherto been relatively weak in Kenya's education system. Kenya's education system is managed by directors at the subnational level, who are each given a tablet and trained to utilise the data from a dashboard displaying compiled coach observation data. The directors are able to monitor the performance levels and activity levels of the coaches using data generated by the use of the tablets.

What impact is the project having?

Researchers' ability to analyse the impact of the National Tablets Programme was limited by the fact that its national rollout meant that comparisons with a control group were impossible. Assessing its impact was also marred by its being put in place alongside the Tusome intervention without any opportunity for staggered implementation, meaning that the impact of Tusome could not be isolated from that of the National Tablets Programme.

The national survey data⁸⁷ available through the Tusome programme does, however, give an insight into whether and how the programme is changing classroom practice and accountability, and into its impact on learning outcomes and the ability of coaches to conduct classroom observations. The national survey results show high levels of use of the tablets by coaches and improvements in learning outcomes. Although it is not possible to isolate the exact impact of the tablets in this outcome from this dataset, this provides a useful indication of the overall efficacy of the programme.

An internal survey of coaches and county directors using the tablets was also conducted,⁸⁸ which sought to understand their views on the quality and effectiveness of the programme. A large percentage of coaches and county directors reported successfully implementing the tablet-based support in classrooms, and the consistent increases over time in the number of classroom observations being conducted suggest that the tablets have been successful in increasing coaches' efficiency. The results also show that coaches consider the tablets' tools to have increased the quality of the instructional support they provide to teachers. There are wide variations in the amount of time coaches spend in classroom observations, but the surveys suggest an increase in the time spent on classroom support, which is key to improving learning outcomes.

The authors thus conclude that ICT investments in low-income countries, when targeted at improving instructional support for teachers, can have positive impacts on classroom practice and learner outcomes on a country-wide level.

A large percentage of coaches and county directors reported successfully implementing the tablet-based support in classrooms

⁸⁷ Piper et al. (2017) ⁸⁸ Ibid.

Chapter 4

Reflections on the case studies



Reflection 1: Promising technology is not enough – we must not forget the human factor.

The compelling case for blended learning

The success or failure of technology-enabled professional development depends, of course, on the quality and relevance of the technology. However, technology alone will not improve teacher professionalism. In the context of Teachers for Teachers, a promising support programme for highly disadvantaged teachers at a large refugee camp in Kenya, Meldenhall said that technology should be 'used to complement and not usurp critical face-to-face teacher professional development activities'.⁸⁹ This emphasis on the need for a mix of professional learning via technology combined with face-to-face elements emerges from all of our case studies.

Emphasis on the need for a mix of professional learning via technology combined with face-to-face elements emerges from all of our case studies

Teachers need training, even in technologies they know well

It has been known for some time that the likelihood of success in technology-enabled training greatly increases when there is pre-existing familiarity on the part of trainees with the relevant technologies. However, even when the technology is familiar, training for teachers in the early stages of a technology-assisted professional development project is often crucial. UNESCO's project in Pakistan, for example, used a familiar technology in the form of mobile phones but also provided three-day training workshops for all participants in the operation of the mobile learning tools and the pedagogical application of the video resources provided via the phone. Teachers may need technical assistance during their learning. Without this, they are at risk of becoming frustrated and losing interest.

Technology can facilitate peer support, collaboration and the creation of communities of practice

Each of our case study projects, without exception, has embodied some of the principles of effective teacher professional learning identified in the international literature, including the importance of a collaborative context for learning. A common theme evident in the successful interventions we have showcased is the alignment of technology with peer support and the creation of both geographically based and virtual communities. In the UNESCO case study from Nigeria teachers benefited from membership of both face-to-face and virtual communities.

Social media provides opportunities for teachers to create their own communities, unconstrained by geography. Thus, TESS-India encourages teachers to use

⁸⁹ Meldenhall (2017: 2)

messaging apps to share examples of promising practices. The Teachers for Teachers project in Kenya successfully used the WhatsApp and Facebook platforms to connect participants with other teachers locally and with international mentors. The director of the project described how the participating teachers effectively 'crowdsourced' the content of their peer learning through collectively identifying priorities via Facebook. There was a 'democratic' quality to the way the participating teachers were able to identify the key topics where they required help, through the power of social media.

Technology can strengthen coaching relationships

The case studies reinforce the importance, emphasised in the international literature, of one-to-one coaching based on diagnostic feedback derived from the observation of classroom practice. Coaching has taken the form both of peer coaching and expert coaching. In the Teaching the Teachers project teachers benefited both from face-to-face peer coaching and technology-enabled coaching from international experts.

The National Tablets Programme in Kenya focuses on using technology to enable expert pedagogical coaches to do their face-to-face jobs better. One of the most important components of the tablets that were provided to coaches is an application that includes an observational tool enabling more systematic analysis of teaching quality. The application also enables the coach to test three randomly selected students and thereby calibrate insights from observation with a picture of learning outcomes.

One of the most important components of the tablets that were provided to coaches is an application that includes an observational tool enabling more systematic analysis of teaching quality

Reflection 2: Mobile technologies have high potential to improve the reach, scalability and flexibility of teacher professional development.

Reach and scale

Several of the case studies demonstrate the remarkable potential of mobile technologies to be used in different ways to support effective teacher professional development in low-income countries. Mobile devices present particularly significant opportunities to extend the reach and scale of professional learning. The rapid expansion of ownership of mobile devices in low- and middle-income countries, particularly of mobile phones, presents an opportunity for the transformation of professional learning. For example, UNESCO's intervention in Pakistan targeted pre-primary school teachers in remote rural areas, using mobile technologies to reach a group with previously limited opportunities for training.

In addition to being able to reach remote regions, mobile technologies offer an opportunity to quickly scale up professional development in a particularly cost-effective way. Unlike traditional forms of professional development, the bulk of the cost is incurred in the initial project development: once the project infrastructure and materials are developed, the project can be extended to more recipients at a relatively low additional marginal cost.

UNESCO's project in Nigeria provides an interesting example of scaling. The project's initial intention was to reach 50 teachers in the Federal Capital Territory of Nigeria. In fact, the professional development materials were accessed by a much larger group of teachers outside of the target group: by the end of the project, the mobile learning service was reaching approximately 70,000 users at no additional cost to the project. EIA in Bangladesh dubbed the phone 'the trainer in the pocket'⁹⁰ and between 2008 and 2017 reached the teachers of millions of students.

The rapid expansion of ownership of mobile devices in low- and middle-income countries, particularly of mobile phones, presents an opportunity for the transformation of professional learning

Flexibility

A key strength of smart phone technology is the wide variety of media the phones have the capacity to host. As a result, professional development projects using these technologies can employ a range of tools to aid teacher engagement. For example, the EIA project provided teachers with a range of audio, video and PDF text materials, via phone.

The literature relating to adult professional learning emphasises the importance of demonstrating effective practice to participants. The digital multimedia that mobile

⁹⁰ Walsh et al. (2015)

phone technologies can host has the potential to *show* participants effective pedagogy rather than simply describing it. Video is particularly useful in this regard in that it can be used both to show demonstrations of pedagogies being used in practice and to encourage teacher self-reflection by watching recordings of their own practice.

Phones alone are not sufficient

It is clear from several of our case studies that, when mobile phones are used for professional learning, they should be just one component in a blended approach to learning that also involves face-to-face elements. Although the EIA project in Bangladesh used the mobile phone as a major mechanism for the transmission of a rich collection of materials, this content was explained via face-to-face training. Teachers were also encouraged to discuss the content with colleagues at school and to collaborate in local meetings with staff from other schools. Similarly, in our case study from Nigeria the teachers met regularly with a teacher trainer facilitator to discuss the use of the content provided by phone.

The challenges of using mobile telephony for professional learning

While professional learning enhanced by the use of phones shows much promise it can also be problematic, often for technical reasons. Designers of professional learning interventions using phones need to undertake a clear-sighted risk analysis. Participants using their own devices may encounter difficulties with software and operating system compatibility. The UNESCO pilot projects in Pakistan and Nigeria led to broadly positive outcomes but also highlighted a range of problems and risks: some teachers did not know how to make full use of the phones; mobile networks were often less reliable than anticipated and sometimes could not provide the bandwidth needed for the transfer of video; problems arose because mobile technology changed during the lifetime of projects. In other projects sponsored by UNESCO, in Mexico and Senegal, teacher engagement flagged over the course of an intervention, mainly because of inconsistent mobile network connectivity.

The promise of mobile phones should not obscure the potential of other technologies

There is a danger of a binary view that phones are effective tools while other technologies are often ineffective. This is not helpful. Phones have limitations; other devices have distinctive potential. Older technologies such as radio can still play a part in teacher professional learning. Teachers can use school laptops to access and modify OER more readily than via a phone. The National Tablets Programme in Kenya makes use of another type of mobile device that is particularly 'fit for the purpose' of supporting the work of instructional coaches.

When mobile phones are used for professional learning, they should be just one component in a blended approach to learning that also involves face-to-face elements

Reflection 3: OER constitute a promising format for professional development resources.

Combining high quality with opportunities for local adaptation

The internet can provide an interactive repository for quality-assured resources that teachers can adapt to fit local circumstances. The concept of OER takes this further. UNESCO defines OER as 'teaching, learning or research materials that are in the public domain or released with an intellectual property license that allows for free use, adaptation, and distribution'.⁹¹ Key characteristics of web-based OER are that they are free to use, free of copyright restrictions, with users permitted to adapt the content as they think appropriate.

In resource-poor contexts OER offer the possibility of high-quality, low-cost resources that can be customised to suit local circumstances. In TESSA and TESS-India, the UK Open University uses Creative Commons Licences to enable teachers to adapt the materials as they think appropriate. The use of these to enable the free distribution of what would otherwise be copyrighted material allows teachers both to use the OER in their original form and to adapt and amend them to suit their local context when appropriate. This makes it possible to contextualise the OER across a wide and culturally diverse geographic span, because the best OER can be easily adapted to local needs and specific curricula. The process of adaptation can itself constitute a particularly effective form of professional development because it provides an opportunity for teachers to take professional ownership of the materials they use.

In resource-poor contexts OER offer the possibility of high-quality, low-cost resources that can be customised to suit local circumstances

OER can be used to promote engaging pedagogical techniques

The impact of OER is clearly dependent on the extent to which the materials are based on effective models of pedagogy. In our case studies, OER have been used carefully as a means of encouraging more engaging teaching methods in low-income contexts. TESSA and TESS-India both utilise OER to encourage teachers to develop a wider range of classroom techniques, with support that recognises the challenges of using more interactive methods in typically large classes. These projects have thus sought to use OER to provide teachers not only with high-quality theoretical content but also with examples of how that content can be operationalised in the challenging context of crowded, poorly resourced classrooms often found in the 'global south'.

⁹¹ See www.unesco.org/new/en/communication-and-information/access-to-knowledge/open-educational-resources



Ensuring that OER programmes meet local needs

Commentators have identified some of the risks and problems that can be associated with OER, such as the danger posed by a naïve assumption that approaches developed in 'global north' contexts will be easily applicable in 'global south' classrooms or the simplistic, exclusive use of English as the medium of professional learning. In order to ensure that content material is appropriate, the TESSA and TESS-India projects, for example, produce resources collaboratively through a partnership between the UK Open University and local academics and education policy experts in Africa and India, respectively. TESSA materials have been developed in Kiswahili, Arabic and French, as well as English. TESS-India has gone even further in ensuring linguistic richness. In addition to English versions, materials have been translated into three varieties of Hindi, Odia, Kannada, Assamese and Bengali.⁹²

Challenges facing those designing OER programmes

TESSA and TESS-India constitute impressive and successful examples of OER in action. Their success has depended upon substantial funding—since OER are, by definition, free to users. Future OER programmes may also require substantial upfront investment from public or philanthropic sources. The UK Open University, which was the prime force behind these projects, has great expertise in the field of Intellectual Property. Future designers of OER need to take great care to ensure that the Intellectual Property of third parties is not infringed when materials are made freely available through Creative Commons Licences. OER ideally require mediation and face-to-face support. The MOOC component of TESS-India has achieved a completion rate of just over 50%. This may seem disappointing but is, in fact, considerably higher than many reported completion rates for MOOCs in other fields. This indicates the importance of local support for teachers engaging with OER for professional learning. Other things being equal, people are less likely to complete online training than face-to-face training. For any professional development that has a technology-enabled element, ongoing support for teachers is likely to be an important feature of successful projects.

In order to ensure that content material is appropriate, the TESSA and TESS-India projects, for example, produce resources collaboratively through a partnership between the UK Open University and local academics and education policy experts in Africa and India, respectively

⁹² See www.tess-india.edu.in/about-tess-india

Reflection 4: High-impact, sustainable technology-enabled solutions depend on local partnership and a sense of local ownership.

Close alignment with local context and co-constructed with local experts

Simply 'importing' professional development content from other countries is likely to fail. As we have seen, one of the distinctive features of TESSA and TESS-India is that way that the primary content was co-constructed by academic experts from the 'global north' and 'global south'. In both projects, a subsequent phase of development involved ensuring that resources were aligned with the specific curriculum requirements in the target countries in Sub-Saharan Africa and target states in India.

The importance of the primacy of the local context was also emphasised by the UNESCO studies of the use of mobile technology in Nigeria and Pakistan. UNESCO organised a similar project in Senegal. Unlike in Nigeria and Pakistan, there were problems with the content used in Senegal because it was not developed from scratch in partnership with Senegalese experts. Instead, it was a 'repurposed' version of some pre-existing South African content.

Careful alignment with local curriculum requirements can considerably increase the chances of success. The reception of EIA in Bangladesh was greatly enhanced because the course content was carefully designed to connect with the ministry textbook for the teaching of English.

Careful alignment with local curriculum requirements can considerably increase the chances of success

High-level endorsement

In several case studies the design has explicitly recognised the importance of senior endorsement. The UNESCO mobile phone projects in Nigeria and Pakistan engaged senior civil servants in their governance. The EIA team in Bangladesh was similarly energetic in ensuring endorsement from the highest levels of the government. The project in Bangladesh was promoted to schools and the public as being in keeping with the prime minister's 'Digital Bangladesh' priority.⁹³ TESS-India was developed not only in partnership with state authorities but also through a close collaboration with India's federal Ministry of Human Resource and Development, and the materials were developed to align with the pedagogic strategies outlined in the National Curriculum Framework.⁹⁴

⁹³Walsh et al. (2015) ⁹⁴Wolfenden (2015)

Working with and strengthening local professional development and school improvement infrastructure

To a striking extent, several of the case study projects have sought to develop links with key 'actors' in the relevant education systems. This has both reinforced key messages and provided opportunities for the achievement of an irreversible, sustainable change beyond the life of the project. A good example of local partnership development is evident in TESSA and TESS-India: pedagogical resources are produced through a collaboration between UK and academics and policy experts in partner countries, ensuring that the content meets the needs of the context and encouraging local ownership. The UNESCO project in Pakistan used the Federal College of Education as a key provider of training related to the project. EIA in Bangladesh worked through the offices of the *upazilas*—the sub-district support tier that works closely with schools. Kenya's education system at the subnational level is managed by county-level directors, who have each been given a tablet and trained to use the data from a dashboard of aggregate coach observation data for the purposes of accountability. A data dashboard such as this has the potential to improve the accountability structures of the MoE.

Several of the case study projects have sought to develop links with key 'actors' in the relevant education systems

Reflection 5: The design and delivery of effective technology-enabled professional learning depends on high-quality impact data and careful piloting of solutions.

The importance of impact evaluation

The designers of the solutions for our case studies took the measurement of impact seriously and these projects can collectively be characterised as being data-rich. The evaluation reports from our case study projects are typically balanced, highlighting weaknesses and learning points as well as achievements. The UNESCO studies of Pakistan and Nigeria, for example, are impressive in terms of the clarity with which they identify both problems and achievements.

In some cases, the impact measurement methodology would have been stronger if the approach had gone beyond capturing teacher perceptions of impact and attempting to measure changes in student outcomes. EIA in Bangladesh represented an example of impressive practice in this regard: the project gathered both teacher perception data and independently conducted assessments of changed teacher behaviours in the classroom and student learning gains in the subject of English. This approach made possible a much stronger claim of effectiveness than would otherwise have been the case.

The evaluation reports from our case study projects are typically balanced, highlighting weaknesses and learning points as well as achievements

Independent assessment of impact

For some of the case study projects the only available evaluation resulted from an internal evaluation exercise. While these appear in every case to have been undertaken professionally, there are clearly benefits to an objective assessment of impact. After several years of operation TESSA benefited from a formative evaluation carried out by a team of two independent evaluators in 2012. The assessment of student outcomes in EIA undertaken not by the project team but by an independent assessment organisation.

A phased approach to implementation with a careful pilot phase

Policy-makers are often impatient and want to go straight to scale. In several of our case studies ultimate 'rollout' was clearly helped by an emphasis on the need for a pilot phase from which lessons could be learnt. The National Tablets Programme in Kenya began with a pilot of just 70 users in 2013; by 2015 it had been scaled to all of Kenya's 1,170 instructional coaches across the whole

country.⁹⁵ EIA in Bangladesh benefited from a particularly extended pilot phase. The project undertook a 'developmental research' phase in 2008–2011 in order to refine the solution through classroom trials.⁹⁶ A particularly rigorous pilot not only identified some professional and technical problems that needed addressing for the rollout phase but also enabled the designers to find high-performing local teachers whose authentic practice could be filmed as part of the resources for the rollout phase.⁹⁷

The case for RCT measurement

The use of RCTs is often seen as the so-called 'gold standard' of impact measurement. Systematic literature reviews of education reform initiatives tend to place the greatest weight on evaluation that uses an experimental method such as an RCT, with a clearly defined control group of teachers who did not receive the intervention. None of case studies has used this method.

RTI International has made the case for RCTs for many years, and used RCT evaluation in prior work in Kenya that provided the context for the design of the National Tablets Programme. The tablets programme itself has involved comprehensive national rollout and the key evaluation report rightly points out that, by definition, there can be no comparative 'control' group in such a project.

Designers of future technology-enabled professional development programmes may wish to use an RCT methodology to generate more robust evidence of impact. The use of RCT could be particularly helpful during a pilot phase.

Designers of future technology-enabled professional development programmes may wish to use an RCT methodology to generate more robust evidence of impact

⁹⁵ Piper et al. (2017) ⁹⁶ Shohel and Power (2010) ⁹⁷ Walsh et al. (2015)

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Education Development Trust Highbridge House, 16–18 Duke Street, Reading, Berkshire RG1 4RU

T +44 (0) 118 902 1000 E enquiries@educationdevelopmenttrust.com W www.educationdevelopmenttrust.com

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