

HELPDESK TOPIC BRIEF

Characteristics of Effective Teacher Education in Low- and Middle-income Countries

What are they and what role can EdTech play?

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About this document

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Reviewer. Dr Sara Hennessy

About the EdTech Hub Helpdesk

The Helpdesk is the Hub's rapid response service, available to the UK Department for International Development (DFID advisers) and World Bank staff in 70 low- and middle-income countries (LMICs). It delivers just-in-time services to support education technology planning and decision-making. We aim to respond to most requests in 1–15 business days. Given the rapid nature of requests, we aim to produce comprehensive and evidence-based quality outputs, while acknowledging that our work is by no means exhaustive. For more information, please visit <https://edtechhub.org/helpdesk/>.

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Commonly used acronyms

HICs	High-income countries
CoPs	Communities of practice
ITE	Initial teacher education, also known as 'pre-service'
LMICs	Low- and middle-income countries
MOOCs	Massive open online courses
OER	Open Educational Resources
RCT	Randomised control trial
TE	Teacher education (both initial and continuous)
TLMs	Teaching and learning materials
TPD	Teacher professional development (continuous) = continuing teacher education = continuing professional development, also known as 'in-service'
VLE	Virtual learning environment

Purpose of this brief

In May 2020, the UK Department for International Development (DFID) invited the Helpdesk to prepare a topic brief on technology-supported teacher education in LMICs. This brief responds to the request and includes:

1. An introduction to teacher education and a summary of the state of current evidence in this area.
2. An overview of 12 characteristics of effective teacher education.
3. Case studies on the use of EdTech to support teacher education.
4. An annotated list of key sources.

Executive summary

Even though teacher education programmes have the potential to improve pupil learning outcomes, the impact of these programmes has varied widely in LMICs. A lack of understanding of the specific characteristics that underpin the success of teacher education programmes can lead to poorly designed interventions.

Current evidence does not allow researchers to conclusively identify the specific drivers of impactful teacher education programmes ([↑International: Sims & Fletcher-Wood, 2018](#)). However, a range of reviews has identified design principles that can potentially promote improved learning outcomes while the existing evidence base develops. This paper analyses a range of literature reviews to identify characteristics of effective teacher education. Specifically, the paper recommends that programme designers:

1. Encourage teachers to focus on their pupils' learning;
2. Share effective practices with teachers using modelling;
3. Acknowledge and build on teachers' existing knowledge, views, and experiences;
4. Focus on developing practical subject pedagogy rather than theoretical general pedagogy;
5. Empower teachers to become reflective practitioners and structure teacher education around practice-based cycles of trial and refinement;
6. Incorporate peer support;
7. Ensure teacher education programmes motivate teachers;
8. Prioritise school-based teacher education;
9. Schedule regular, ongoing teacher education;
10. Provide supporting teaching and learning materials;
11. Ensure support from school leaders;
12. Create a coherent policy environment.

The use of educational technology in teacher education programmes has generated mixed results. Importantly, EdTech cannot fully substitute for in-person teacher education. Instead, EdTech should be used to build on the above characteristics and should be embedded within a framework of good practice in teacher education ([↑Fragile contexts: Lawrie, et al., 2015](#)). For example, instant messaging services can facilitate peer support and video recordings can stimulate critical reflection.

Introduction

Why invest in teacher education?

Teacher education has the potential to significantly improve pupil learning outcomes. A World Bank review paper observed that after teaching at the right level, teacher education programmes have the second-largest impact on pupil attainment in LMICs ([↑LMICs: Evans & Popova, 2016](#)). Moreover, improvements in teaching quality can have positive spillover effects on the impact of other education interventions ([↑Uganda: Buhl-Wiggers, et al., 2017](#)).

Despite this promise, the form and impact of teacher education programmes in LMICs vary widely ([↑LMICs: Popova, et al., 2016](#)). Investments in improving teacher education could be cost-effective since teacher salaries represent the largest item in the primary-level budgets of LMICs ([↑LMICs: Popova, et al., 2018](#)).

Teacher education using EdTech

Schools have attempted to capitalise on educational technology to improve teacher education. Platforms such as WhatsApp and Facebook have been used to build virtual communities of practice ([↑Kenya: Mendenhall, 2017](#)). Digitally produced open educational resources have been used to reduce the costs of teaching materials ([↑LMICs: Haßler, 2020](#)). Video recordings of lessons have enabled teachers to critically reflect on concrete examples of effective practice ([↑United States: Borko, et al., 2008](#)).

However, technology-supported interventions do not always work and cannot be seen as a panacea for poorly designed teacher education programmes ([↑Fragile contexts: Lawrie, et al., 2015](#)). Previous research has attributed the mixed results of previous EdTech-based interventions to attitudinal factors, technical challenges and the pressure that teachers face in other areas of their jobs ([↑Botswana: Boitshwarelo, 2009](#); [↑LMICs: McAleavy, et al., 2018](#)). Notably, the outcome of technology-supported teacher education depends on whether individuals have access to the relevant technologies ([↑LMICs: Orr, et al., 2013](#)).

Access and infrastructure also have implications for the cost of technology-supported teacher education in LMICs. Since these countries tend to have limited technological infrastructure, the use of technology for teacher education will likely cost more there than in high-income countries ([↑sub-Saharan Africa: Haßler, et al., 2018](#)). As such, education decision-makers cannot assume that technology-supported teacher education is the most cost-effective way to raise learning outcomes ([↑LMICs: McAleavy, et al., 2018](#)).

In this paper, we do not posit that technology should be used to enhance teaching quality. Instead, we explore the advantages and disadvantages that different technologies present in relation to characteristics of effective teacher education.

The current state of evidence on teacher education

Even though many publications examine teacher education programmes, the strength of the evidence and the quality of analysis are often problematic ([↑International: Schwille & Dembélé, 2007](#); [↑International: OECD, 2009](#); [↑Latin America and the Caribbean: Bruns & Luque, 2014](#); [↑Kenya: Piper, et al., 2017](#); [↑China: Loyalka, et al., 2019](#)). Evaluations of teacher education programmes are often methodologically weak. In a systematic review on teacher education, [↑Westbrook et al. \(2013: LMICs\)](#) concluded that

“None of the studies evaluated the impact of interventions/reforms using control and treatment schools. A small number of studies used inferential statistics to correlate specific practices with student cognitive attainment; however, they missed details of pedagogic practices. Observation-descriptive studies that drew on mixed methods and used standardised tests or national tests to measure the impact of interventions did not always use baseline tests. Qualitative studies that looked at reforms or existing conditions gave significant details of students, teachers, contexts and practices, but did not systematically assess students’ learning.” (p.3)

Meanwhile, few studies measure the impact of teacher education on pupil learning. Instead, most studies focus on whether teachers adopt the methods that feature in teacher education programmes. These studies usually rely on self-reporting and rarely discuss the observer effect — the likelihood that teachers make an extra effort to use new methods when under observation — where classroom observations take place ([↑LMICs: Orr, et al., 2013](#)).

Moreover, a limited number of studies report on the cost-effectiveness of teacher education programmes. For example, a systematic review on teacher professional development found that only 16% of studies examined the cost-effectiveness of interventions and a further 23% of studies considered overall costs ([↑LMICs: Orr, et al., 2013](#)).

In addition, studies often analyse teacher education programmes as a single package and fail to disaggregate the relative impact of different programme components ([↑United States / International: Wayne, et al., 2008](#); [↑LMICs: Orr, et al., 2013](#); [↑Kenya: Piper, et al., 2018](#)). This practice is problematic as programme designers need to understand characteristics that drive impact, rather than a list of programmes that work ([↑International: Hill, et al., 2013](#)).

Our approach

This topic brief identifies characteristics of effective teacher education based on ten review papers:

- [↑ Cordingley, et al., 2015: ↑England / International](#)
- [↑ Darling-Hammond, et al., 2016: United States / International](#)
- [↑ Hardman, et al., 2011: Kenya / Uganda / Tanzania](#)
- [↑ Haßler, et al., 2020: Sub-Saharan Africa](#)
- [↑ McAleavy, et al., 2018: LMICs](#)
- [↑ Orr, et al., 2013: LMICs](#)
- [↑ Popova, et al., 2018: ↑LMICs](#)
- [↑ Power, et al., 2019: ↑Poor and marginalised communities](#)
- [↑ Timperley, et al., 2007: ↑New Zealand](#)
- [↑ Westbrook, et al., 2013: ↑LMICs](#)

The focus, methodology and conclusions of the above studies are described in more detail in Appendix 1. Based on these studies, this brief recommends that programme designers:

1. Encourage teachers to focus on their pupils’ learning;
2. Share effective practices with teachers using modelling;

3. Acknowledge and build on teachers' existing knowledge, views, and experiences;
4. Focus on developing practical subject pedagogy rather than theoretical general pedagogy;
5. Empower teachers to become reflective practitioners and structure teacher education around practice-based cycles of trial and refinement;
6. Incorporate peer support;
7. Ensure teacher education programmes motivate teachers;
8. Prioritise school-based teacher education;
9. Schedule regular, ongoing teacher education;
10. Provide supporting teaching and learning materials;
11. Ensure support from school leaders;
12. Create a coherent policy environment.

In outlining these characteristics, the paper recognises the limitations of using current evidence to establish a set of design principles for teacher education ([↑International: Sims & Fletcher-Wood, 2018](#)). The existing evidence base does not allow researchers to distinguish the 'active ingredients' of teacher education programmes from causally redundant features ([↑ibid](#)). In the absence of a suitable alternative, this paper adopts the position of [↑Scutt & Baeyer \(2019: International\)](#)

“We have a plausibly helpful set of design principles expressed across a number of reviews about professional development. While no individual feature would seem to offer any guarantee of success, it seems like a good bet to stay focused on carefully designed programmes that align broadly with all of them until such time as a developing evidence base can offer us more granular and specific recommendations.” (p. 66)

Under each characteristic, the paper highlights evidence from a range of other studies. The paper draws on evidence from low- and middle-income countries where it exists and evidence from high-income countries where relevant. All references within the paper indicate the source's geographic focus to clearly highlight the context of different findings.

Characteristic 1. Encourage teachers to focus on their pupils' learning

Teacher education programmes should explicitly promote pupil learning outcomes ([↑England / International: Cordingley, et al., 2015](#); [↑LMICs: Evans & Popova, 2016](#); [↑sub-Saharan Africa: Haßler, et al., 2018](#)). Pupil learning outcomes cover a broad range of outcomes including foundational and socio-emotional skills.

Teachers should be supported to understand how their pupils learn ([↑England / International: Cordingley, et al., 2015](#)). Teacher education programmes should prepare teachers to use formative assessment to collect information on their pupils' learning ([↑England / International: ↑Cordingley, et al. 2015](#)). In doing so, these teachers place their pupils at the centre of the teaching and learning process.

Teachers can use data from formative assessment to tailor educational content to pupil needs ([↑LMICs: World Bank, 2018](#); [↑International: Education Commission, 2019](#)). In a series of randomised controlled trials (RCTs) on Pratham's Teaching at the Right Level programme, the Abdul Latif Jameel Poverty Action Lab (J-PAL) found that this practice consistently improves learning outcomes ([↑India: Banerjee, et al., 2016](#)). In Ghana, [↑Duflo, et al. \(2020\)](#) conducted a randomised evaluation of a teacher professional development programme that focused on targeting instruction to the learning level of pupils. After two years, the programme increased pupil achievement on a combined English and numeracy test by 0.08 standard deviations (SD). The programme entailed an annual per-pupil cost of US \$10.65 and led to test score gains of 0.36 SD per US \$100 ([↑ibid.](#)).

Characteristic 2. Share effective practices with teachers using modelling

Teachers can only raise learning outcomes if they are aware of and use teaching practices that have been shown to be effective ([↑sub-Saharan Africa: Haßler, et al., 2020](#)). What practices improve pupils' learning is the subject of research and debate within the educational community. [↑Westbrook, et al. \(2013: LMICs\)](#) identified three strategies that in turn lead to effective teaching practices:

1. Giving feedback and paying sustained and inclusive attention to all pupils.
2. Creating an environment where pupils feel safe.
3. Drawing on pupils' prior knowledge and relating content to the everyday experiences of learners.

The Great Teaching Toolkit ([↑England / International: Coe, et al., 2019](#)) suggests that teachers who want to increase their effectiveness should focus on four priority areas with 17 individual elements within them:

1. Understanding the content they are teaching and how it is learnt.
2. Creating a supportive environment for learning.
3. Managing the classroom to maximise the opportunity to learn.
4. Presenting content, activities and interactions that activate their pupils' thinking.

Providing a comprehensive summary of this field of research is beyond the remit of this work. However, the above principles give an indication of the type of practices that could be shared with teachers during teacher development sessions.

Research suggests that modelling certain practices during teacher development sessions is a useful way of sharing effective teaching practices with teachers ([↑United States / International: Darling-Hammond, et al., 2016](#); [↑LMICs: McAleavy, et al., 2018](#); [↑LMICs: Westbrook, et al., 2013](#)). Teachers need to have seen and experienced different ways of teaching. Otherwise, they cannot be expected to implement new techniques alone in their classrooms ([↑LMICs: McAleavy, et al., 2018](#)). [↑Westbrook, et al. \(2013: LMICs\)](#) suggest that modelling will be especially effective if it takes place in situations that approximate teachers' real environment such as their classroom.

Teachers can discover new effective practices by inviting their colleagues into their classroom and observing them while they teach ([↑sub-Saharan Africa: Haßler, et al., 2020](#)). For example, a review from New Zealand explains how successful programmes asked specialist mathematics teachers to work with small groups of children so that other teachers could observe their practice ([↑New Zealand Government, 2018](#)). Teachers may also be given access to artefacts such as high-quality lesson plans, unit plans, pupils' work, and video or written case studies of teaching ([↑LMICs: McAleavy, et al., 2018](#); [↑United States / International: Darling-Hammond, et al., 2016](#)).

Modelling can even be taken a step further with teacher education programmes incorporating active learning. Teachers can be engaged and asked to design and try out teaching strategies themselves. This allows programmes to move away from traditional lecture-based models that have no connections to teachers' classrooms ([↑United States / International: Darling-Hammond, et al., 2016](#)). [↑Popova, et al. \(2018: LMICs\)](#) found that when teachers engaged in such lesson enactment, there was an associated significant 0.10 SD increase in pupils' learning outcomes.

Using videos to provide examples of effective practice

Since video is becoming more accessible and affordable, interest in the use of this technology for teacher education has grown ([↑International: Major & Watson, 2017](#)). Using video within this context has several advantages. It enables teachers who do not have models of effective teaching at hand to observe examples of authentic high-quality teaching ([↑LMICs: McAleavy, et al., 2018](#)). Video also captures complex information that would otherwise be difficult to convey ([↑International: Marsh & Mitchell, 2014](#)). This is reflected in one Bangladeshi teacher's comment (reported in [↑Bangladesh: Shohel & Power, 2010](#)) who states that

“Without video, it would have been very difficult initially to understand activities of students and teachers in the classroom and how teachers are using gestures, which gesture students are picking up rapidly, continuity of lessons and how to use devices and so on.”

Teachers describe videos as being more engaging than non-digital resources ([↑India: Wolfenden, et al., 2017](#)). If they are adapted to the local context, videos can demonstrate to teachers that a new pedagogy is possible in their own classroom practice ([↑Bangladesh: Woodward, et al., 2014](#)). In addition, videos can ensure teacher education is personalised, especially if teachers record their own lessons ([↑ibid.](#)). Such a practice can enable teachers to obtain an objective view of their teaching by removing the emotional involvement that features during and immediately after a lesson ([↑International: Roth, et al., 2007](#)). Finally, video can be a useful stimulus for in-depth and analytical peer discussion ([↑United States: Borko, et al., 2008](#); [↑Poor and marginalised communities: Power, et al., 2019](#)).

Perhaps because of these various advantages, several positive outcomes have been associated with the use of video for teacher education. The Teacher Education through School-based Support (TESS)-India programme, for example, used low-cost tablets and mobile phones to document teachers' classroom practices ([↑Poor and marginalised communities: Power, et al., 2019](#)). A study of this programme reported that teachers became more confident in their teaching and classroom management as a result of viewing the videos. Teachers who took part in TESS-India also said that videos were the main drivers of their pedagogic change ([↑India: Wolfenden, et al., 2017](#)). Teachers' classroom practice and pupils' engagement improved as a result of this programme ([↑Poor and marginalised communities: Power, et al., 2019](#)).

A different programme, English in Action (EIA), reported similar positive outcomes. This programme originally used iPods and later Nokia phones with SD cards to provide teachers with videos of effective practices, which were discussed in pairs. Teachers who had benefited from this programme spoke positively of the videos. They were able to specifically demonstrate activities they had copied from the video clips and applied with proficiency in their classrooms. Interestingly, a critical reflection on lessons learned from this programme points out that teachers needed to be guided through the videos. They did not always see in the videos what the programme designers wanted them to see ([↑Bangladesh: Woodward, et al., 2014](#)).

Despite these encouraging reports, exhaustive evidence on the use of videos for teacher education in LMICs is lacking ([↑International: Major & Watson, 2017](#)). Even when the international literature on the subject is taken into account, results are inconclusive. A recent scoping review found that it is not currently possible to confidently claim that video is effective to support teacher professional development (TPD). Although video viewing is potentially powerful, practitioners should approach any large investment in video-based teacher education carefully ([↑ibid.](#)).

Characteristic 3. Acknowledge and build on teachers' existing knowledge, views, and experiences

It is important for teacher education programmes to acknowledge and leverage teachers' backgrounds ([↑England / International: Cordingley, et al., 2015](#); [↑LMICs: Westbrook, et al., 2013](#)). The teaching workforce is heterogeneous, with teachers differing in terms of their gender, location within a country, educational experience and qualification, teaching experience, and attitudes and beliefs ([↑LMICs: Westbrook, et al., 2013](#)).

Teachers often start to participate in teacher education programmes after several years of experience ([↑sub-Saharan Africa: Haßler, et al., 2020](#)). This is especially true of untrained or under-trained teachers and in the case of teacher professional development. As a result of these years of experience, teachers will have developed a set of beliefs and techniques that they regularly use ([↑LMICs: Westbrook, et al., 2013](#)). They are thus likely to reject new ideas that go against their pre-existing beliefs unless these beliefs are surfaced and conflicts are addressed as part of their professional development ([↑England / International: Cordingley, et al., 2015](#); [↑LMICs: McAleavy, et al., 2018](#); [↑LMICs: Orr, et al., 2013](#); [↑LMICs: Popova, et al., 2018](#); [↑New Zealand: Timperley, et al., 2007](#)).

Teachers may need to try out new ideas many times before their practice changes long-term ([↑LMICs: McAleavy, et al., 2018](#)). Indeed, experimental, observation and neuroscience research shows that it is necessary to repeatedly practice new behaviours before they become automatic ([↑International: Wood & Neil, 2007](#), as cited in [↑International: Sims & Fletcher-Wood, 2018](#)). Interestingly (especially for the discussion on characteristic 2 and 8), meta-analysis results suggest that practising new techniques in the environment where you aim to reproduce them in the future (i.e., the classroom) helps to overwrite old habits ([↑High-income countries: Webb & Sheeran, 2006](#), as cited in [↑International: Sims & Fletcher-Wood, 2018](#)).

Evidence suggests that the needs of novice teachers differ from those of more senior staff members ([↑LMICs: McAleavy, et al., 2018](#)). Novices' working memory quickly becomes overwhelmed by complex tasks ([↑International: Paas & van Gog, 2006](#), as cited in [↑International: Sims & Fletcher-Wood, 2018](#)). Educating novices as experts would not be appropriate. Instead, they should be provided with sufficient scaffolding to stop them from becoming overwhelmed and help them focus on the salient aspects of a situation ([↑International: Sims & Fletcher-Wood, 2018](#)).

Characteristic 4. Focus on developing practical subject pedagogy rather than theoretical generic pedagogy

Teacher education programmes need to anchor the pedagogical techniques that are transmitted to teachers within a subject-specific context. Professional development which focuses on generic strategies is unlikely to be effective. Strategies such as group work, targeted questioning or formative assessment, which are taught without reference to the context of, for example, mathematics, science, or literacy, are unlikely to become part of teachers' everyday practice ([↑England / International: Cordingley, et al., 2015](#); [↑United States / International: Darling-Hammond, et al., 2016](#); [↑LMICs: McAleavy, et al., 2018](#); World Bank study, as cited in [↑Poor and marginalised communities: Power, et al., 2019](#)). This idea is supported by the research of [↑Popova, et al. \(2018: LMICs\)](#) who developed an In-Service Teacher Training Survey Instrument (ITTSI) and used it to compare the characteristics of programmes that resulted in large pupil learning gains. The authors found that programmes with no subject-specific focus had a statistically significantly 0.24 SD lower impact on pupil learning ([↑LMICs: Popova, et al., 2018](#)).

This conclusion should not be taken to mean that teacher education within schools needs to occur solely in groups that are segregated in terms of curriculum subject. [↑Haßler, et al. \(2020: sub-Saharan Africa\)](#) suggest that pedagogical subject differences only become important once basic pedagogy is mastered. Until that is the case, teachers of mathematics, for example, can still benefit from hearing about the pedagogy used to teach literacy. In fact, in small schools, conducting whole-school teacher education enables every teacher to learn from their most experienced and effective colleagues. These colleagues may or may not be teaching the same curriculum subject as them. Hence whole-school teacher education can still be appropriate.

Characteristic 5. Empower teachers to become reflective practitioners and structure teacher education around practice-based cycles of trial and refinement

As [†Orr, et al. \(2013: LMICs\)](#) point out, allowing teachers to apply in the classroom what they learned during professional development sessions can significantly enhance their performance. Applying new skills in different contexts can allow teachers to deepen their understanding of theory ([†England / International: Cordingley, et al., 2015](#); [†New Zealand: Timperley, et al., 2007](#)).

[†Timperley et al. \(2007: New Zealand\)](#), for example, describe how allowing teachers to apply what they have learned can help them change some of their prevailing internal discourses. They cite the example of professional development courses which attempted to shift teachers' focus from facts, procedures and memorisation to processes of inquiry and to the development of pupils' conceptual understanding. As teachers became more able to implement inquiry-based approaches in practice, they could see pupils' learning deepening. This then changed what they thought constituted effective teaching.

Teachers should not only be encouraged to apply what they learned in the classroom but they should also be helped to reflect on their teaching. This is considered to be central to alter teacher practice and sustain learning ([†England / International: Cordingley, et al., 2015](#)). [†Westbrook, et al. \(2013: LMICs\)](#), for example, describe six studies across Ghana, Pakistan, Benin, and India which implemented follow-up sessions where teachers were observed and given constructive feedback. Regular meetings were also facilitated by trainers or mentors where the teachers' practice was discussed. The authors report that teachers' practices reflected their training. They used a wide range of practices, resulting in higher pupil attainment. This may be because structured reflection enables teachers to move from simply thinking about how a lesson went to more immediate reflection-in-action ([†ibid.](#)). This, in turn, can inform instructional decision-making: teachers are able to judge the impact of teaching on learning and identify next teaching steps ([†New Zealand: Timperley, et al., 2007](#)).

Characteristic 6. Incorporate peer support

Several reviews note that peer support is a key element of effective teacher education (examples include [↑LMICs: Orr, et al., 2013](#); [↑LMICs: Westbrook, et al., 2013](#); [↑Fragile contexts: Burns & Lawrie, 2015](#); [↑Poor and marginalised communities: Power, et al., 2019](#)). As [↑Darling-Hammond, et al. \(2016: United States / International\)](#) state:

“High-quality PD [professional development] creates space for teachers to share ideas and collaborate in their learning, often in job-embedded contexts. By working collaboratively, teachers can create communities that positively change the culture and instruction of their entire grade level, department, school and / or district” (p. v)

Yet, collegiality alone is not enough. Learning can be limited when teacher education programmes only focus on working together. Instead, teachers need to have a shared commitment to improving pupil learning outcomes, establishing common goals and developing approaches to achieve them. If these conditions are in place, communities of practice can enable teachers to build their understanding of effective teaching and challenge problematic beliefs as they analyse the impact of teaching on pupil learning ([↑New Zealand: Timperley, et al., 2007](#)).

Different approaches to peer support can enable teachers to effectively collaborate.

- Teachers can share teaching and pupil learning resources, lesson plans and assessment practices ([↑LMICs: Westbrook, et al., 2013](#)). This may be useful in cases where several teachers teach the same grade level.
- Teachers can work together to plan concrete classroom activities and to jointly reflect on their past experiences ([↑sub-Saharan Africa: HaBler, et al., 2018](#)).
- Structured peer observation can enable teachers to deepen their understanding of effective teaching practices and to support their colleagues' professional development.
- Teachers can engage in collective enquiry to explore their beliefs, challenge their assumptions and identify shared steps for positive change. The [↑New Zealand Government \(2018\)](#) outlines several approaches to collective enquiry such as diagnosing pupil strengths and weaknesses and posing 'sensitive questions' that prompt teachers to examine their practices.

The viability and success of school-based communities of practice depend on a number of enabling factors. Teachers will require a suitable venue and a regular time slot to participate in peer support ([↑Kenya / Rwanda: Rossignoli, et al., 2020](#)). School leaders have an important role in incorporating peer support into the timetable and monitoring the progress of meetings. The role of school leaders should reflect the capacity of each community of practice. Low-performing communities of practice benefit from directive support and regular feedback from school leaders ([↑ibid.](#)). In contrast, high-performing communities of practice with a consistent number of attendees benefit from greater organisational autonomy ([↑ibid.](#)).

A variety of sources support the above statements which can be considered to be relatively robust. However, [↑Sims & Fletcher-Wood \(2018: International\)](#) suggest that interest in peer support stems from budget limitations at the school level. As such, schools are more likely to offer collaborative teacher education programmes rather than expensive one-on-one support. [↑Sims & Fletcher-Wood \(2018: International\)](#) note that peer support may not underpin the success of teacher education

programmes even though it features in a number of high-quality interventions. More research is needed to clarify the extent to which this statement is supported by evidence.

Virtual communities of practice and social media

In the absence of face-to-face communication, mobile technologies can enable teachers to engage in peer support through virtual communities of practice. Where schools have a limited number of subject specialists, virtual communities of practice can allow teachers of a certain subject to connect with colleagues elsewhere. At the same time, virtual communities of practice can be multidisciplinary. Multidisciplinary communities can allow teachers to understand when it may be useful to refer to content from other areas of the curriculum.

In practice, virtual communities of practice often meet on social media. In South Asia, the [British Council \(2015\)](#) found that 64% of teachers regularly use Facebook and WhatsApp to participate in professional interest groups. In Kenya, the Teachers for Teachers programme created a WhatsApp group to connect teachers in the Kakuma refugee camp with their colleagues and a global mentor ([Kenya: Mendenhall, 2017](#)). Teachers used the platform to share ideas on classroom management, pupil assessment and strategies to improve their instructional practice ([ibid.](#)). After one year, approximately 50% of participating teachers reported that they had effectively incorporated suggested pedagogical approaches into their lessons ([ibid.](#)).

Characteristic 7. Ensure teacher education programmes motivate teachers

Teacher motivation plays a central role in teacher education. Yet, there is debate around the exact role that teacher motivation plays. On the one hand, teacher motivation may be necessary for teacher education programmes to be effective. [↑King \(2014: Ireland\)](#), for example, states that the impact of teacher education programmes depends on the willingness of teachers to engage with the techniques shared in sessions. On the other hand, [↑Sims & Fletcher-Wood \(2018: International\)](#) argue that teachers are more likely to be willing to participate in teacher education programmes that have a demonstrated positive impact. In reality, the relationship between effective teacher education and teacher motivation is likely to be bidirectional. Teachers will likely be more enthusiastic about effective teacher education programmes yet teacher education programmes still need to motivate teachers to participate if they are to support changes in teaching practice.

Evidence also points to the fact that engaging in teacher education activities helps to raise teachers' confidence. Twelve studies cited in [↑Orr, et al. \(2013: LMICs\)](#) found that, when teachers became more aware of new methods and applied these methods in the classroom, they developed more positive attitudes towards their pupils and their work. We also know that the low social status that is often associated with being a teacher negatively impacts the motivation of teachers ([↑sub-Saharan Africa and South Asia: Bennell & Akyeampong, 2007](#)). Engaging in a teacher education programme can raise teachers' prestige within the community and incentivise them to engage in such programmes ([↑LMICs: Binns & Wrightson, 2006](#); [↑Brazil: Bof, 2004](#)).

Several other factors can also help to motivate teachers to participate in teacher education programmes. In terms of the programmes' content, [↑McAleavy, et al. \(2018: LMICs\)](#) state that it should not start by criticising teachers' current practice otherwise teachers are unlikely to benefit from it. Content should also be overtly relevant to the participants and their day-to-day experiences ([↑England / International: Cordingley, et al., 2015](#); [↑Kenya: Hardman, et al., 2009](#); [↑LMICs: Popova, et al., 2018](#)). [↑Wolf, et al. \(2015: DRC\)](#) illustrate this point and describe a programme located within a culture where women are often not expected to forcefully share their opinions. This programme did not acknowledge the cultural difference and placed female teachers in male-dominated peer-support groups. Ultimately, the programme not only did not have positive outcomes but also served to decrease teachers' motivation.

Alternatively, [↑Bainton, et al. \(2016: sub-Saharan Africa\)](#) and [↑The Education Commission \(2019: International\)](#) propose that teacher motivation could be raised using a series of incentives including:

- Providing awards and certificates upon the completion of certain courses;
- Creating clear career pathways for teachers linked to teacher education;
- Providing financial incentives for teachers.

Supporting those ideas, [↑Popova, et al. \(2018: LMICs\)](#) evaluated teacher education programmes where participation was linked to promotion, salary or status. These programmes led to pupil learning levels that were 0.12 SD higher than other programmes.

Massive Open Online Courses

Education providers have attempted to use Massive Open Online Courses (MOOCs) to offer teachers a medium to develop their pedagogical and content knowledge, obtain course certificates and enhance their career paths.

However, education decision-makers should not use technology — or MOOCs — to totally replace school-centred approaches to teacher education ([↑LMICs: McAleavy, et al., 2018](#); [↑International: Education Commission, 2019](#)). In Indonesia, [↑Burns \(2013: Indonesia\)](#) compared a fully online teacher education course with two programmes that used online learning to support school-based coaching. While approximately a third of teachers dropped out of the online course, no participants dropped out of the hybrid school-based programmes ([↑ibid.](#)) This study corroborates the findings of reports that identify high attrition rates as a weakness of MOOCs ([↑Asia: Lim, et al., 2018](#)). In Kenya and North America, the Peer-to-Peer University programme combined MOOCs with a series of weekly in-person study groups. Approximately three-quarters of study group participants reported that these regular meetings played an important role in providing socio-emotional support and opportunities for group discussion ([↑International: Fellows, 2018](#)).

Several papers have indicated that MOOCs can contribute to — rather than reduce — educational inequities. The majority of MOOC participants are educated men from high-income countries ([↑International: Christensen, et al., 2013](#); [↑LMICs: Liyanagunawardena, et al., 2014](#)). Learners in low- and middle-income countries face a number of barriers to participation in MOOCs such as low levels of digital literacy, a lack of access to hardware and connectivity, an inability to understand English ([↑LMICs: Liyanagunawardena, et al., 2014](#)). A key challenge involves adapting content to the context of learners who have specific linguistic and cultural needs ([↑International: Knox, 2013](#); [↑High-income countries: Major, et al., 2018](#); [↑Australia: Partridge, et al., 2011](#)). Even though education providers such as Coursera have launched schemes to translate materials, cultural differences may continue to limit the capacity of learners to fully engage with online materials ([↑United Kingdom: Baxter & Haycock, 2014](#)).

Studies also show that learners with a lower socioeconomic status are less likely to effectively engage with online learning ([↑International: Rohs & Ganz, 2015](#)). Accordingly, a pivot to MOOCs and wholly online teacher education further disadvantage the most marginalised teachers and pupils ([↑South Africa: Adam, 2020](#))

Characteristic 8. Prioritise school-based teacher education

School-based teacher education programmes are more effective than workshops at an external venue, which often take the form of one-off sessions (↑[Poor and marginalised communities: Power, et al., 2019](#); ↑[LMICs: McAleavy, et al., 2018](#)). Workshops hosted in a central location such as a hotel or a government office are associated with lower levels of impact on pupil learning outcomes (↑[LMICs: Popova, et al., 2018](#); ↑[South Africa; Cilliers, et al., 2018](#)).

In school-based models, teachers facilitate regular peer-to-peer learning sessions over the academic year. This approach to teacher education offers several advantages. School-based programmes enable teachers to see, trial, and reflect on new teaching practices in the context of their classroom. The emphasis on peer facilitation can reduce the impact of disruptions to external workshops. Moreover, this approach is also more equitable as teachers in the same school will have access to similar professional development opportunities (↑[sub-Saharan Africa: Haßler, et al., 2020](#)).

School-based teacher education does not preclude the possibility of external support. On-site tutors can receive external guidance via printed materials. For instance, the Transforming Teacher Education and Learning (T-TEL) programme in Ghana provided professional development tutors with openly licensed teaching manuals. After two years of the programme, the percentage of tutors who used pupil-focused teaching methods rose from 26.1% to 65.9% (↑[Ghana: T-TEL, 2017](#)).

Similarly, teachers can benefit from external expertise while engaging in school-based teacher education (↑[England / International: Cordingley, et al., 2015](#); ↑[LMICs: McAleavy, et al., 2018](#)). External experts often take on a coaching role (↑[Poor and marginalised communities: Power, et al., 2019](#)). In conventional coaching programmes, external facilitators provide teachers with in-person advice on classroom practice over a sustained period of time (↑[United States: Kraft, et al., 2018](#)). Evidence from both HICs and LMICs indicates that coaching can positively impact instructional quality and pupil attainment (↑[LMICs: Orr, et al., 2013](#); ↑[LMICs: McAleavy, et al., 2018](#); ↑[United States: Kraft, et al., 2018](#)). At the same time, coaching may have little to no impact on learning outcomes when coaches give general advice rather than individualised support (↑[Malawi: Sailors, et al., 2014](#); ↑[United States / International: Darling-Hammond, et al., 2016](#)). Above all, the quality and focus of coaching prove more important than either the mode of delivery or number of contact hours (↑[United States: Kraft, et al., 2018](#)).

Unfortunately, coaching can be expensive and labour-intensive (↑[LMICs: Orr, et al., 2013](#)). A limited supply of expert teachers can reduce the feasibility of on-site coaching. Moreover, ↑[Piper & Zuilkowski \(2015: Kenya\)](#) found that increasing the teacher-to-coach ratio reduces potential learning gains.

Using mobile phones and tablets for virtual coaching

Several studies have explored the possibility of virtual coaching as a cheaper and less labour-intensive alternative to on-site coaching. In high-income countries, virtual coaching has been shown to be as impactful and cost-effective as in-person coaching at improving instructional quality and pupil learning (↑[United States: Kraft, et al., 2018](#)).

In South Africa, however, a longitudinal study found that virtual coaching has less impact on learning outcomes than on-site coaching over time (↑[Cilliers, et al., 2020](#)). The Early Grade Reading Study programme examined the impact of virtual coaching on the English language proficiency of non-native speakers. The programme tracked the same cohort of pupils over three years and offered coaching to different teachers each year. In the virtual coaching arm, teachers received phone-based support from an external coach as well as a tablet with preloaded lesson plans. After

three years, the impact of on-site coaching on English listening comprehension was more than twice as high as the impact of virtual coaching ([†ibid.](#)). Moreover, virtual coaching had no impact on English reading proficiency and a negative impact on home language literacy ([†ibid.](#)). The study found that teachers who received virtual coaching reduced their use of lesson plans and supplementary teaching materials over time without on-site support ([†ibid.](#)). The absence of in-person meetings can limit the capacity of virtual coaches to provide observation-based feedback and to monitor the application of new teaching practices.

At the same time, virtual coaches may be able to effectively support peer facilitators. In the Brazilian state of Ceará, school-based pedagogical leaders observed teachers in the classroom before using Skype to share their feedback with a virtual coach who would give advice on strategies to improve teaching ([†Brazil: Bruns, et al., 2018](#)). After one year, teachers at participating schools spent more time on instruction and increasingly used interactive teaching practices ([†ibid.](#)). Importantly, the programme led to learning gains in Portuguese and mathematics ([†ibid.](#)).

Characteristic 9. Schedule regular, ongoing teacher education

There is a strong consensus around the fact that one-off workshops do not work. Teachers need time to learn, practice, implement, and reflect upon new strategies. Change can take time to embed ([↑United States / International: Darling-Hammond, et al., 2016](#); [↑LMICs: McAleavy, et al., 2018](#); [↑LMICs: Orr, et al., 2013](#); [↑New Zealand: Timperley, et al., 2007](#)).

Of course, the length of teacher education programmes alone is not enough to ensure success. As [↑Timperley, et al. \(2007: New Zealand\)](#) and [↑Cordingley, et al. \(2015: England / International\)](#) point out, how teacher education time is spent is more important.

Moreover, teacher education sessions should be scheduled regularly to allow for multiple instances of support and follow-up activities ([↑England / International: Cordingley, et al., 2015](#); [↑LMICs: Orr, et al., 2013](#)). Creating such a rhythm enables programmes to follow an iterative schedule, where each part of the curriculum is covered more than once. Meta-analysis studies, in fact, show that, if repeated practice is included in a programme, the influence of the length of that programme on teachers disappears ([↑International: Basma & Savage, 2018](#); [↑High-income countries: Kraft, et al., 2018](#)).

When scheduling teacher education programmes, it is also important to recognise the time constraints that teachers may face and to try not to overburden them ([↑LMICs: Orr, et al., 2013](#)).

Characteristic 10. Provide supporting teaching and pupil learning materials

The provision of teaching and pupil learning materials (TLMs) — teacher guides, structured lesson plans, textbooks, and workbooks — as part of a broader programme of teacher education helps to improve pupils' learning ([↑Poor and marginalised communities: Power, et al., 2019](#)). This is demonstrated by an RCT conducted in Kenya which found that the provision of professional development and coaching without supplementary TLMs did not have a significant impact on pupil attainment. However, including TLMs improved pupil learning scores by up to 1.29 SD in English and Kiswahili ([↑Kenya: Piper, et al., 2018](#)).

The provision of TLMs alongside teacher education is also cost-effective. [↑Piper, et al. \(2018; Kenya\)](#) find that every additional USD\$100 spent on a mix of teacher education, coaching and pupil textbooks led to an additional 6.4 pupils being able to read at the government benchmark compared to 1.9 pupils when books were not included. Adding teachers' guides to the mix of teacher education, coaching and books led to an additional 14.7 pupils being able to read at the government benchmark. This shows that teachers' guides can be especially cost-effective.

Of course, the provision of materials alone is not sufficient. The quality of materials also matters. Existing evidence suggests that coherence between teacher education and teaching and learning materials used in the classroom is important. Specifically, the content of teaching and learning materials needs to be aligned with the local curriculum and should relate to the day-to-day experiences of teachers. Materials should be written in a language that is familiar to teachers since the use of an official or foreign language can weaken teacher learning. Above all, teachers need to be prepared to integrate these resources into their lessons. ([↑sub-Saharan Africa: Altinyelken, 2010](#); [↑Myanmar: Lall, 2011](#); [↑LMICs: Orr, et al., 2013](#); [↑Bangladesh: Power, et al., 2012](#)).

Open educational resources

Open educational resources (OER) are defined as educational content which is legally, technologically, and socially free ([↑sub-Saharan Africa: Haßler & Mays, 2015](#)). Under Creative Commons licences, OER can often be copied, redistributed, and adapted for any purpose, even commercial. They are designed in such a way that they can be accessed and downloaded without restriction in multiple formats ([↑Ghana: Koomar, 2020](#)). As such, OER can help to reduce the cost of production of TLMs. Once adapted to the local context, they can serve as the basis upon which teacher / tutor manuals or pupil textbooks are developed.

There are several initiatives which have made use of OER for teacher education. These include OER4Schools, T-TEL, Open Learning Exchange (OLE) Ghana, TESS-India and Teacher Education in sub-Saharan Africa (TESSA). For example, the OER4Schools programme provides a set of multimedia materials for school-based TPD used in Zambia, Kenya, Uganda, Rwanda, South Africa, and Sierra Leone. The materials outline plans, learning objectives and activities for 28 teacher-led workshops. The programme provides video clips to illustrate interactive pedagogy and technology use in the African context. OER4Schools offers resources for teacher-facilitators to lead workshops and for teacher-participants to engage in workshops. The sessions involve collaborative planning and discussion to support reflective practice ([↑sub-Saharan Africa: Hennessy, et al., 2016](#); [↑sub-Saharan Africa: Haßler, et al., 2018](#)).

A qualitative study of OER4Schools in Zambia found that participating teachers increasingly adapted lessons to the skill level and learning needs of pupils and incorporated more practical and group work into their classes. The programme also supported pupils to actively engage in activities and develop a deeper subject knowledge ([↑sub-Saharan Africa: Hennessy, et al., 2016](#)). Moreover, teacher interviews carried out 18 months after a year-long intervention in one Zambian school showed that the initiative had become self-sustaining ([↑Zambia: Haßler, et al., 2020](#)).

Similarly, TESSA sets out to improve access to quality school-based teacher education. Programme developers partnered with African educational experts to build a bank of openly licensed content. The resources aim to support teachers to bring interactive teaching practices into the classroom. Teachers can access content on an online platform where materials can be printed or downloaded onto tablets and SD cards. An independent impact evaluation found that the programme had a significant impact on the instructional practices of teachers and trainees ([↑sub-Saharan Africa: Harley & Simiyu Barasa, 2012](#)).

Community servers

In order to reach the most marginalised, OER can be printed. As an alternative to printing, and when an internet connection is not available, community servers can be used to distribute OER digitally. Examples of community servers include the Remote Community Hotspot for Education and Learning (RACHEL), produced by World Possible, the EDBox, sold by ED4Free and Kolibri, developed by Learning Equality.

The EDBox and RACHEL are pieces of hardware. However, Kolibri is an app which gives access to an educational platform that can be set up on a range of hardware including Windows, MacOS, and Linux (including Raspberry Pi) computers. After connecting to the internet, the servers store websites and open content and make them available over a local wireless connection. Teachers with devices that have the ability to connect to the wifi, but cannot due to a lack of local internet availability, can connect to the servers and access OER through websites such as Wikipedia, Moodle or Khan Academy.

The potential of community servers for teacher education has not been empirically evaluated. Their effectiveness depends on the quality of the resources they contain. Distributing resources through community servers does not guarantee that teachers will make good use of them, especially if they do not have adequate levels of digital literacy. Moreover, the community servers which require hardware can be expensive. The EDBox costs USD\$168 and allows up to 25 simultaneous users. RACHEL costs between USD\$169 and USD\$749 and allows between 10 and 50 simultaneous users. This initial cost can be prohibitive, especially since the devices will additionally require electricity and maintenance.

Audio-based teaching and learning materials

Audio-based instruction can be organised into three broad categories: classical educational radio broadcasts, interactive radio instruction (IRI), and interactive audio instruction (IAI). Classical educational radio involves the delivery of audio-based learning content that pupils listen to on the radio (e.g., stories and pre-recorded lectures). Alternatively, IRI and IAI broadcasts guide learners and facilitators through interactive activities on the radio or on devices such as MP3 players and CDs ([↑International: Burns, 2013](#)). The evidence examined below focuses on uses of IRI and IAI in support of broader teacher education initiatives.

A randomised evaluation of the Tikichuela programme found that structured interactive audio lessons can support pupil-centred learning and increase pupil learning outcomes ([↑Paraguay: Naslund-Hadley, et al., 2014](#)). In Paraguay, the Tikichuela programme developed pre-recorded interactive audio materials for the preschool mathematics curriculum to address teaching deficiencies. Subsequently, teachers based their classes on these structured audio lessons that explained key concepts in Spanish and Guarani. This randomised evaluation found that the intervention generated statistically significant positive improvements of 0.16 SD in standardised test scores. Notably, the bilingual programme improved learning equally among Guarani- and Spanish-speaking pupils. The RCT, however, showed that the initiative exacerbated the existing gender gap as boys improved more than girls. The RCT found qualitative evidence that teachers called on boys to conduct activities more often than girls. These findings suggest that structured audio lessons may be useful to teachers as a form of TLM that they can integrate into lessons. They

also simultaneously illustrate the importance of educating and supporting teachers to actively address gender biases ([†Ghana: Steeves & Kwami, 2017](#)).

[†Thukral \(India: 2015\)](#) studied the effects of teacher practice on pupil learning outcomes for an ‘English is Fun’ IRI programme in India, which bundled together daily English language lessons for pupils and pedagogical techniques for teachers. The study highlighted the role of teacher practice in IRI, supporting the notion that teachers need instructional support to improve pupil learning. In particular, the study separated out primary and secondary expectations for teachers. Primary expectations included setting up the IRI classroom and following instructions from the programme, and secondary expectations included modelling pedagogies and engaging with pupils beyond the instructions. While both sets of expectations had an impact on learning, the study found that secondary expectations had a larger impact.

In general, there is limited literature on the effectiveness of delivering teacher education through broadcast media such as radio and television. However, IRI and IAI have potential to model interactive pedagogy for teachers through a practice-based cycle. For example, in-class scaffolding and support for teachers could be provided through IRI to trial interactive techniques in lessons before reflecting with colleagues in teacher group meetings.

Using mobile phones to access TLMs

Mobile devices — smartphones, non-smartphones, media players — can increase access to teaching and learning materials. In Bangladesh, for example, [†Shohel & Power \(2010: Bangladesh\)](#) interviewed 12 teachers about their experiences of using iPods to access course materials, videos of classroom practice, and classroom resources (e.g., audio recordings of textbooks, stories, and poems) as part of the English in Action (EIA) programme. Teachers frequently mentioned that they used such resources to learn more about effective pedagogy, prepare for TPD sessions, and support their own learning of the English language.

After the initial pilot, the EIA programme was scaled to 12,500 teachers in 2014. Two quantitative studies assessed the programme’s impact on teacher practice. The first study found that the proportion of teachers speaking English in the classroom rose from 27% to 71% while the percentage of pupils speaking English in the classroom rose from 2–4% to 88% ([†Bangladesh: English in Action, 2011](#)). Meanwhile, the second study reported improvements in English language skills for both pupils and teachers ([†Bangladesh: Walsh, et al., 2012](#)).

Moreover, [†Ekanayake & Wishart \(2014: Sri Lanka\)](#) studied the use of mobile phone cameras to supplement science lessons in Sri Lanka. Both teachers and pupils took photos that were used to supplement lessons (e.g., collecting pictures of leaves). The study found that the use of these images enabled pupils to apply what they learned in the classroom to the outside world. The teachers used the images to clarify instructions about classroom experiments and to identify any misconceptions that pupils may have had about the content covered.

Characteristic 11. Ensure support from school leaders

School leaders can act as catalysts and enhance the effectiveness of teacher education ([↑Poor and marginalised communities: Power, et al., 2019](#); [↑Bangladesh: Woodward, et al., 2014](#)). In fact, evidence from the United States found that school leadership accounts for up to 25% of the variation in pupils' learning outcomes ([↑International: Education Commission, 2019](#)). According to a study by [↑Global School Leaders \(2020: LMICs\)](#), developing school leadership's capacity to support teacher development can also be a highly cost-effective way of increasing pupil outcomes. The effectiveness of school leaders' support might increase when they work in close proximity to the contexts where teachers are working ([↑LMICs: Orr, et al., 2013](#)).

In terms of what leaders can do to support teachers' professional development, they should not leave learning to the teachers but instead, become involved in professional development themselves ([↑England / International: Cordingley, et al., 2015](#); [↑New Zealand: Timperley, et al., 2007](#)). They play a key role in developing the school's vision and should create a learning culture which promotes a commitment to professional growth ([↑LMICs: McAleavy, et al., 2018](#); [↑New Zealand: Timperley, et al., 2007](#)). They should analyse quantitative and qualitative data on pupil learning to focus on how and why learning is happening and discover potential obstacles ([↑England / International: Cordingley, et al., 2015](#)). Data can also be used to provide targets for pupil outcomes and monitor whether they have been met ([↑New Zealand: Timperley, et al., 2007](#)). Finally, leaders are needed to manage the professional development process and create a supportive environment. For example, they can help to schedule professional development sessions to create a 'rhythm' of teacher education and ensure teachers have the time to contextualise what they have learned for specific subjects or groups of pupils ([↑England / International: Cordingley, et al., 2015](#); [↑LMICs: McAleavy, et al., 2018](#)).

The above points are illustrated by a preliminary study of communities of practice in Kenya and Rwanda. The study found that communities of practice (CoPs) need appropriate leadership to thrive. School leaders can provide basic management and remove timetabling barriers. The effectiveness of the CoP meetings is also higher when accountability structures are in place. However, CoPs needs change over time. As teachers' capacity is built, they become more autonomous and leaders need to adjust their leadership style ([↑Kenya / Rwanda: Rossignoli, et al., 2020](#)).

Unfortunately, the reality on the ground is often different from the scenarios described above. A recently published review of empirical research on school leadership in LMICs describes how school leaders currently lack the skills needed to support teachers. They cannot track and measure progress towards improved learning outcomes. Since leaders are tasked with administrative responsibility, they often spend less than 25% of their time managing activities related to pupil learning ([↑LMICs: Global School Leaders, 2020](#)). To remedy this situation, the PEAS schools in Uganda have developed an innovative solution. They have split administrative and instructional leadership into two distinct roles: a school director and a headteacher. This approach is encouraged by the [↑Education Commission \(2019: International\)](#).

Using mobile phones for communication and accountability

Given the expansion of mobile networks in sub-Saharan Africa, mobile phones may have a number of uses to support teacher professional development. SMS messaging has been used in countries such as Burundi, Nigeria, Uganda, and the Democratic Republic of Congo (DRC) to facilitate citizen engagement and to connect parents, teachers, school leaders, and governments ([↑sub-Saharan Africa: RapidSMS, 2013](#); [↑DRC: World Bank, 2017](#)). For example, a World Bank pilot in the DRC, Allô

École!, enables parents to provide feedback on teacher absenteeism and textbook distribution to the Ministry of Education through SMS or interactive voice response (IVR) ([↑DRC: World Bank, 2017](#)).

Mobile phones could similarly be used by school leaders to increase teacher accountability. An RCT in Niger assessed the effects of mobile monitoring for an adult education programme on pupil test scores ([↑Niger: Aker & Ksoll, 2015](#)). One hundred and sixty villages were randomised into three groups: adult education, monitoring, and control. The adult education and monitoring villages had two adult literacy classes that met five days a week. In the monitoring villages, data collection agents made weekly calls to the literacy teacher, the village chief, and two randomly selected pupils. The study found that the adult education intervention increased reading scores by 0.23 SD and the monitoring raised scores by an additional 0.18 SD. The monitoring also had a positive effect on teacher motivation, supporting the importance of accountability and the role that school leaders and other players can hold in maintaining a supportive environment for teachers.

Characteristic 12. Create a coherent policy environment

Teacher education programmes need to be aligned with the local cultural norms, policy environment and school conditions ([↑Kenya / Uganda / Tanzania: Hardman, et al., 2011](#)). [↑Westbrook, et al. \(2013: LMICs\)](#), for example, state that if parents do not have positive attitudes towards teachers using formative assessment or the local language in their practice, teachers will find it harder to implement new practices (ibid.). Teachers are accountable not only to school leaders but also to parents. Likewise, high-stake examinations can compel teachers to use more teacher-directed methods to cover the curriculum quickly. This is often the case, even if the curriculum is designed around competencies that are meant to promote learner-centred pedagogies. ([↑LMICs: Westbrook, et al., 2013](#); [↑Kenya / Uganda / Tanzania: Hardman, et al., 2011](#); [↑Tanzania: Hardman, et al., 2015](#); [↑Schweisfurth, 2011](#)). It is thus important to ensure the content delivered by teacher education programmes is consistent with the country's wider policy trends and is clearly linked to the curriculum and assessment requirements. ([↑Poor and marginalised communities: Power, et al., 2019](#); [↑New Zealand: Timperley, et al., 2007](#)).

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Appendix 1: Annotated list of key sources

Cordingley, P., Higgins, S., Coe, R., Greany, T., Buckler, N., Coles-Jordan, D., Crisp, B., & Saunders, L. (2015). *Developing Great Teaching: Lessons from the international reviews into effective professional development*. Teacher Development Trust.

Reference	† Cordingley, et al. (2015)
Focus	Identify and explore what the evidence from literature reviews indicates about continuous professional development and learning (CPDL) programme design and what is necessary for it to be successful in England.
Methodology	Review of reviews published since 2000
Relevant conclusions	<p>Seven conclusions for policy-makers:</p> <ol style="list-style-type: none"> 1. While individual schools should remain accountable for their own improvement, it is important to consider where and how appropriate external expertise can be brought in. 2. CPDL programmes should be sustained over two terms to a year but teachers in England are less likely to engage in such sustained programmes. It is thus important to consider how schools and alliances can be incentivised to provide the sustained resources and commitment required for effective CPDL. 3. Time on its own is not the answer. Quality is just as important. 4. The skills and knowledge required by facilitators of CPDL are particularly key. 5. It is important to focus on generic and subject-specific pedagogy. 6. While peer support and learning is a fundamental ingredient of effective CPDL, it is not sufficient in its own right. Relying only on peer support could lead to the recycling of existing practice if teachers are not also given structured and facilitated opportunities to engage with new evidence, theory, and practice. 7. It is important to use evidence; both from pupils' responses to teachers' developing practices and on the strength of the evidence and rationale underpinning the CPDL.

Darling-Hammond, L., Hyler, M. E., Gardner, M., & Gardner, M. (2016). *Effective Teacher Professional Development*.

Reference	↑Darling-Hammond, et al. (2016)
Focus	Identify features of approaches that have been demonstrated to have a positive link with pupil outcomes and offer rich descriptions of these models to inform those seeking to understand the nature of the initiatives.
Methodology	Review 35 methodologically rigorous studies that have demonstrated a positive link between teacher professional development, teaching practices, and pupil outcomes in high-income countries.
Relevant conclusions	Seven shared features of effective professional development: <ol style="list-style-type: none"> 1. Is content focused 2. Incorporates active learning 3. Supports collaboration 4. Uses models of effective practice 5. Provides coaching and expert support 6. Offers feedback and reflection 7. Is of sustained duration

Global School Leaders. (2020). *A review of Empirical Research on School Leadership in the Global South*.

Reference	↑Global School Leaders (2020)
Focus	Document the existing evidence base on school leadership in the Global South and lay out a research agenda for the future.
Methodology	Reviewed more than 70 studies
Relevant conclusions	School leaders lack the skills required to support teachers in improving their practice. School leadership training can improve pupil outcomes and, when successful, is highly cost-effective. The emerging research base suggests the following are components of training programmes that can be effective at improving pupil outcomes: <ul style="list-style-type: none"> • Programmes focused on supporting school leaders in their use of pupil-level learning data.

- Programmes working with government schools that focus on the school leaders' teacher development activities as the main channel through which they influence pupil maths and literacy outcomes.
- Programs that incorporate coaching of school leaders to complement traditional training models.

Hardman, F., Ackers, J., Abrishamian, N., & O'Sullivan, M. (2011). Developing a systemic approach to teacher education in sub-Saharan Africa: Emerging lessons from Kenya, Tanzania and Uganda. *Compare: A Journal of Comparative and International Education*, 41(5), 669–683.

Reference

[↑Hardman, et al. \(2011\)](#)

Focus

Explores the challenges and lessons learned from Kenya, Tanzania and Uganda with regard to the development and strengthening of pre- and in-service teacher training.

Methodology

Case studies of teacher development initiatives in Kenya, Tanzania and Uganda.

Relevant conclusions

The authors recommend:

- The alignment of pre-service and in-service teacher education.
- The development of a planning continuum that integrates the use of distance education and face-to-face delivery in a flexible model, and supports teachers in the classroom by ensuring resources, capacity building, and incentives are devolved to those responsible for observation, coaching, and assessment.
- The alignment of policies, plans, and institutional arrangements when programmes are implemented on a national scale.
- The undertaking of a broad situation analysis of all factors affecting education quality and access as well as an analysis of existing structures, systems, policies, and plans to ensure that programmes can be scaled up.

Haßler, B., Bennett, G., & Damani, K. (2020). *Teacher professional development in sub-Saharan Africa: Equity and scale*. In C. McNaught & S. Gravett (Eds.), *Embedding Social Justice in Teacher Education and Development in Africa*. Routledge.

Reference

[↑Haßler, et al. \(2020\)](#)

Focus	Teacher professional development in sub-Saharan Africa, especially mathematics education.
Methodology	Review of reviews.
Relevant conclusions	Principles for effective teacher professional development: <ol style="list-style-type: none"> 1. TPD should focus on pupil learning outcomes — what the pupil does. 2. TPDL should focus on effective teaching practices — what the teacher does. 3. TPDL should promote teacher learning and recognise teachers as professionals. 4. TPDL should be sequenced and long-lasting. 5. TPDL should involve headteachers, school leaders, and the community and comprise school-based professional development with a focus on active teacher learning and modelling interactive pedagogy.

McAleavy, T., Hall-Chen, A., Horrocks, S., & Riggall, A. (2018). *Technology-supported professional development for teachers: Lessons from developing countries*. Education Development Trust.

Reference	↑McAleavy, et al. (2018)
Focus	Reflect on the potential of technology to enhance the professional learning of teachers. Capture what might be learnt from a selection of the world's most interesting examples of technology-assisted in-service professional development in low-income countries.
Methodology	Used three reviews of the characteristics of effective professional development (↑Timperley, et al., 2007 ; ↑Cordingley, et al., 2015 ; ↑Darling-Hammond, et al., 2016) to come up with ten characteristics of high impact professional development.
Relevant conclusions	Ten characteristics of high impact professional development: <ol style="list-style-type: none"> 1. Classroom-based expert coaching relationships can provide good opportunities for learning. 2. Teachers need collaborative opportunities to process new professional learning. 3. Professional learning takes time. 4. Approaches should be based on sound principles of adult learning. 5. Teachers should be encouraged to adapt guidance

principles to suit context.

6. Teachers particularly benefit from subject-specific training opportunities.
7. Teachers benefit from exposure to models of effective practice.
8. Effective professional development recognises differences between individual teachers and their different starting points.
9. School leaders have an important role to play in professional learning.
10. Teacher 'buy-in' is a key determinant of the success of professional development interventions.

Orr, D., Westbrook, J., Pryor, J., Durrani, N., Sebba, J., & Adu-Yeboah, C. (2013). *What are the impacts and cost-effectiveness of strategies to improve performance of untrained and under-trained teachers in the classroom in developing countries? Systematic review.* EPPI-Centre, Social Science Research Unit, Institute of Education.

Reference	↑Orr, et al. (2013)
Focus	Investigate approaches to increasing the skills of untrained or under-trained teachers that are likely to be most effective in LMICs. Also, comment on cost-effectiveness.
Methodology	Systematic review. Included 130 studies, 23 studies of which were reviewed in-depth.
Relevant conclusions	Ten conclusions for policy-makers and users: <ol style="list-style-type: none"> 1. Interventions should clearly state whether they aim to improve pupil learning, enhance teacher subject knowledge, or grant certification. 2. It is better to target school clusters and individual schools, as well as individual teachers. 3. Interventions which are based on analysis of the knowledge, experience, and needs of unqualified and under-trained teachers (UUTs) in the contexts in which they work are more likely to result in positive outcomes. The active involvement of teachers and their mentors in the design of any intervention is similarly more likely to have positive outcomes. 4. Interventions should involve frequent, regular engagement with self-study materials, and / or taught sessions, and / or discussions with peers, and / or the opportunity to apply new learning and skills in the classroom. 5. Proximity to the site of inputs to the UUTs' classroom

supports engagement and application of learning and affects availability of support from local tutors, peers, or experienced teachers.

6. Initially, workshops can be most effective when they are used for specific purposes. Once a programme is up and running, workshops used to discuss teaching methods in the reality of the UUTs' classrooms and critical reflection with smaller numbers of participants may be more effective than the more traditional use of workshops to transmit subject knowledge in a lecture mode.
7. Well planned and produced self-study materials focused on subject knowledge but including practical activities can support teacher learning at a distance.
8. The quality of trainers is important, so interventions should include plans for their training. Briefing, resourcing, and capacity building of other stakeholders such as teacher colleagues, headteachers, administrators, and community members might create conditions to support interventions more effectively.
9. Demands on the time and resources of UUTs must be balanced with their other daily commitments.
10. There needs to be recognition of the constraints to classroom improvement within the specific contexts in which the UUTs work. Sustainable change to professional practice occurs slowly over a substantial amount of time.

Popova, A., Evans, D. K., Breeding, M. E., & Arancibia, V. (2018). *Teacher Professional Development around the World: The Gap between Evidence and Practice*. World Bank.

Reference

[↑Popova, et al. \(2018\)](#)

Focus

1. Propose a survey instrument — the In-Service Teacher Training Survey Instrument (ITTSI) — to document the design and implementation details of in-service teacher training programmes.
2. Characterise the current evidence on in-service teacher training in LMICs, comparing the characteristics of programmes that resulted in large pupil learning gains with those that did not.
3. Assess current in-service TPD practices from a sample of at-scale TPD programmes across the world, and to analyse how current practice diverges from the best practices coming out of evaluated programmes.

Methodology

First, the authors developed a standardised instrument to characterise in-service teacher training. Second, they applied this

instrument to already evaluated TPD programmes to understand which TPD characteristics are associated with pupil learning gains. Third, they applied the survey instrument to a sample of at-scale TPD programmes to see how these programmes line up with what evidence suggests works in teacher training.

Relevant conclusions

Characteristics positively associated with programme impact on pupil learning include linking participation to incentives such as promotion or salary implications, having a specific subject focus, incorporating lesson enactment in the training, and including initial face-to-face training, among others. Meanwhile, programme implementers themselves most commonly mention the provision of mentoring follow-up visits, engaging teachers for their opinions and ideas, and designing programmes in response to local context as being responsible for positive impacts on pupil learning.

Power, T., Hedges, C., McCormick, R., & Rahman, S. (2019). *Evidence-based approaches to improving teachers' skills, in schools serving poor and marginalised communities*. Pan-Commonwealth of Learning Forum.

Reference

[↑Power, et al. \(2019\)](#)

Focus

Seek to set-out a succinct summary of the evidence-base on effective approaches to improving teaching quality for the children of poor and marginalised communities, before practically considering how such evidence-based approaches are manifest across different programmes from Bangladesh and India, to Palestine and Zimbabwe.

Methodology

Review of reviews

Relevant conclusions

Teacher development programmes are effective when there are:

1. Teacher learning resources addressing subject knowledge and / or pedagogic practice.
2. Clear expectations of application in the classroom, often with some aspect of prescribed activity (typically in the form of guides or instructions for specific classroom activities which teachers may follow or adapt), supporting resources or even in extremis, scripted lessons.
3. Opportunities for teacher peer- or co-learning, supported over time, within or between schools.
4. Significant, sustained follow-on support by someone outside the school, usually in a coaching / mentoring or facilitating role (i.e., acting as a more experienced peer, not a 'trainer' or 'master trainer').

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5. Clear links to pupil curriculum and assessment requirements.
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Timperley, H., Education Counts, & Iterative Best Evidence Synthesis (programme). (2007). *Teacher professional learning and development: Best Evidence Synthesis Iteration (BES). Education Counts.*

Reference

[↑Timperley, et al. \(2007\)](#)

Focus

Consolidate the international and New Zealand evidence around the emerging knowledge base about how to promote teacher learning in ways that impact on outcomes for the diversity of pupils in our classrooms

Methodology

Create a theoretical framework made of 84 different characteristics of the professional learning environment which was used to analyse over 97 studies.

Relevant conclusions

Opportunities for teachers to engage in professional learning and development can have a substantial impact on pupil learning.

Seven elements in the professional learning context were found to be important: providing sufficient time for extended opportunities to learn and using the time effectively; engaging external expertise; focusing on engaging teachers in the learning process rather than being concerned about whether they volunteered or not; challenging problematic discourses; providing opportunities to interact in a community of professionals; ensuring content was consistent with wider policy trends; and, in school-based initiatives, having leaders actively leading the professional learning opportunities.

Four aspects of the content of professional learning were found to be impactful: integrating theory and practice, as well as pedagogical content knowledge, assessment information and how pupils learn; creating clear links between teaching and learning and pupils and teachers; using assessment to focus teaching and enhance self-regulation; allowing for sustainability by delivering an in-depth understanding of theory and the ability to judge the impact of teaching.

Westbrook, J., Durrani, N., Brown, R., Orr, D., Pryor, J., Boddy, J., & Salvi, F. (2013). *Pedagogy, Curriculum, Teaching Practices and Teacher Education in Developing Countries. Final Report. Education Rigorous Literature Review. Department for International Development.*

Reference	†Westbrook, et al. (2013)
Focus	Review existing evidence on pedagogy, curriculum, teaching practices, and teacher education in developing countries to inform future programme design and policy-making.
Methodology	Systematic review included 489 reports, 62 of which were reviewed in-depth..
Relevant conclusions	<p>Teachers' use of communicative strategies that are interactive in nature are more likely to be effective. The review identified two specific teacher attitudes that encouraged the use of three interactive and communicative strategies (feedback, creating a safe space, and drawing on pupils' backgrounds) which facilitated the implementation of six specific teaching practices (flexible use of whole-class, group and pair work, use of learning materials, questioning, drawing on sound content knowledge, use of language and code-switching, planning and varying lesson sequences) that engaged pupils. While all teachers may use the above practices, effective teachers use them communicatively and place pupils at the centre of the teaching and learning process.</p> <p>Thinking about how teacher education can best support the above effective pedagogy, the review found that teacher education should incorporate peer support, be aligned with teachers' needs, with the promoted pedagogy, the modes of assessment of teachers' practice and the follow-up monitoring of teachers. Additionally, teacher education should be supported by headteachers.</p>
