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Technology Use for Teacher Professional Development in Low- and Middle-Income Countries

Recommendations for policy from a systematic review

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About this document

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Notes

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Reviewers

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Key recommendations

- ■ Ensure technology-enabled TPD is linked to tangible impacts on teaching practices and student learning; measure these systematically.

- ■ Exploit the power of video, SMS Messaging, subject software, preloaded devices, and social media for mediating teacher professional development (TPD) — through careful planning and testing across different contexts.

- ■ Consider how technology can catalyse teacher reflection and peer learning, provide resources or lesson plans for classroom experimentation, and/or support coaches and mentors.

- ■ Use blended models to optimally support critically important human relationships; include face-to-face contact between teachers and mentors / coaches / trainers, district officials, and school leaders.

- ■ Work with teachers to design TPD that is relevant, contextualised, and aligned with teachers' / students' diverse needs.

- ■ In particular, work and test with a wide range of users to understand how to effectively use technology to support TPD for marginalised teachers and learners.

- ■ For sustainability and scalability, consider the wider TPD ecosystem and coordinate / manage partners closely; understand structural and cultural influences on technology-mediated TPD operating at classroom, school, district, regional, and national levels

This policy briefing includes: Key outcomes, Policy recommendations and practical Guidelines for how EdTech can be used for TPD in LMICs, with specific case examples.

Introduction: Using EdTech for TPD

Educational technology (EdTech) can play a powerful role in supporting teachers. Pre-service education and in-service teacher professional development (collectively defined here as TPD) are pivotal in raising teaching quality and, therefore, learning outcomes for children and young people in low- and middle-income countries (LMICs). However, TPD opportunities in LMICs are limited and unsustained, with mixed outcomes. To be effective and sustainable, TPD should assess and cater to teachers' diverse needs and contexts; technology offers productive opportunities to provide tailored and flexible forms of formal and informal professional learning.

This briefing paper summarises the key messages for policymakers and TPD programme designers and implementers emerging from a recent systematic literature review conducted by the same authors.⬆Hennessy et al. (2022) analysed how EdTech is used in LMICs to support teachers' learning. After screening over 4,000 records spanning 2008–2020, a rigorous synthesis of 170 relevant studies in 40 LMICs was undertaken.

Key outcomes of the review

- Overall, the review highlighted some **promising forms of technology-mediated TPD in LMICs** for teacher-supported learning and coaching, teacher self-learning, and peer learning; these include virtual coaching, social messaging, blended learning, video-stimulated reflection, devices pre-loaded with lesson plans, and teaching guides, and use of subject-specific software / applications.

- However, it revealed a paucity of published research that addresses the **sustainability, cost-effectiveness, or tangible impacts on classroom practice and/or student learning**, especially literacy skills. Further research on technology-supported TPD programmes **focusing on marginalised learners and teachers is also needed**.

- Few studies have used participatory or design-based approaches to TPD research. An important opportunity to **leverage the voices and experiences of teachers and local communities** at all stages of a TPD programme is thus missed.

Building on the successes and addressing the gaps identified should in turn help policy-makers, school leaders, teacher educators, trainers and other practitioners, to design effective technology-supported TPD that fits the needs of all teachers, and ultimately their students.

Policy recommendations

1. Work with teachers to design TPD interventions

All teachers are professionals capable of reflecting on, critiquing, and developing their own practice and recognising their own agency to effect change. TPD initiatives must therefore support teachers as individuals, and work with them to co-create TPD models that are relevant to their needs and that leverage their skills and capacities to improve teaching and learning (e.g., ⬆Anwar, 2017, Pakistan). For example, consider establishing a teacher advisory group or forum, or using focus groups or surveys to assess teacher needs' and interests.
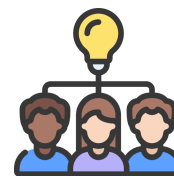
2. Leverage EdTech to enhance teaching practices

EdTech should be used to complement, not supplement or replace, the skills and capabilities of teachers and practitioners. Preloaded devices that provide teachers with easily accessible, innovative teaching and learning resources to use in the classroom, SMS messages with lesson plans, or guides for (semi-)structured pedagogy, are all examples of how EdTech can be used to enhance teachers' classroom practices. While structured lesson plans can support teachers in utilising new teaching techniques, overly scripted ones may be inappropriate to sustain pedagogical change across contexts (⬆Piper et al., 2015: Kenya). Thus, EdTech must be leveraged in appropriate forms and quantities to ensure practices are in fact enhanced, and not hindered. Indeed, lesson planning and the use of dynamic curriculum-aligned teaching and learning materials are two practices that can improve student learning.

3. Systematically monitor and evaluate how TPD impacts on student learning

Professional learning mediated through technology use can contribute to improving teaching quality and student learning outcomes. While several studies measured TPD programmes' impact on teachers' pedagogical / subject knowledge (17%), skills (10%), or classroom practice (12%), very few examined the subsequent impact on students' knowledge and skills (5%). Impact on student learning must remain central

to all technology-supported TPD programmes and evaluations. Pre/post student evaluations or more rigorous randomised control trials (RCTs) are two ways of doing this.

4. Explore how EdTech-mediated TPD can improve student literacy

Literacy was examined in only 13 (<8%) of the 170 publications reviewed, while nearly twice as many studies (25) examined maths. This makes literacy one of the less-frequently studied subjects, despite pre-Covid-19 statistics estimating that the majority of 10-year-old children in LMICs cannot read a simple text (⬆UIS, 2017). TPD's potential impact on student literacy is an important evidence gap that must be prioritised.

5. Use EdTech to support teacher trainers and educators

While there is a need for more evidence in this area, EdTech can support the work of teacher trainers and educators. Structured coaching software and observation tools can prompt feedback provided to teachers (⬆Bruns et al., 2018, Brazil). Virtual learning environments can allow teacher trainers and educators to share content with teachers or to provide support outside of normal class / training time (e.g., ⬆Basal, 2015, Turkey). These are important uses of EdTech to help teacher trainers or educators do their jobs more effectively, in turn supporting teachers to reflect on their own practices and progress regarding personal and reform priorities.
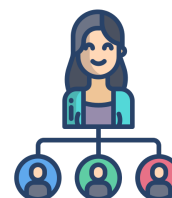
6. Foster trust and positive relationships

TPD is most effective in an environment of trust and mutual respect for trainers, coaches, district officials and school leaders, the education system, the TPD programme goals, and/or technology in general. ⬆Cilliers et al. (2021: South Africa), for example, found that virtual coaching loses efficacy over time because trusting relationships are harder to secure without face-to-face interaction. Supportive and constructive relationships should be prioritised in technology-supported TPD programmes, integrated into teachers' codes of conduct, teacher qualification frameworks, or education sector plans.

7. Explore formal and informal uses of EdTech to facilitate teacher communities of practice
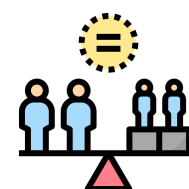
Informal models of TPD include organic and teacher- or facilitator-led online and/or remote communities of practice (CoP) through, for example, Facebook, WhatsApp, or other commonly-used social media (e.g., ↑Taner, 2018: Ghana). Blended models are particularly powerful. CoPs are increasingly recognised (featured in 37 publications) as critical for teacher well-being, especially during the Covid-19 pandemic and school closures. Effective forms of informal social media use should be explicitly encouraged, while simultaneously ensuring pedagogical rigour of the ideas being promoted, and alignment of content and TPD objectives.

## 8. Focus on equity and supporting the most marginalised

Technology-supported TPD needs to include strategies for using technology to reach and include marginalised groups of both teachers and learners, and to cater for diverse (learning) needs. This includes women and girls, displaced persons, and learners and teachers with disabilities, among others. Although 40 LMICs were represented in the reviewed publications, 96 further LMICs were not. Only 5 countries (all middle-income) had 10 or more studies. More research is needed in under-represented countries and regions, as well as in remote or rural communities, which often have additional challenges (e.g., infrastructure, socio-economic status, conflict / emergency, attendance of girls, language barriers). Marginalised teachers and learners can benefit hugely from tailored TPD and technology-facilitated connection to others in similar contexts.

9. Consider the TPD ecosystem

When designing technology-supported TPD programmes, it is imperative to consider the whole ecosystem (see ↑Hennessy et al., 2022, Figure 1), including:
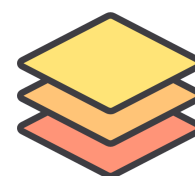
- At the **district and national** levels: developing a deeper understanding of the structural and cultural factors that can support or constrain technology-mediated TPD.

- At the **school** level: ensuring schools and communities are equipped with the physical and human resources to support technology-mediated TPD.

- At the **teacher** level: taking account of teachers' professional learning needs, experience, expertise, motivations, and agency, to increase appropriateness and efficacy of programmes.

- Most importantly, at the **student** level: monitoring impact on student learning outcomes.

10. Strive for scalability and sustainability of TPD programmes

Only 11% of all studies reviewed reported any detail of cost, few were large-scale, and only 18% were longitudinal (evaluating impact along multiple points in time). This suggests an urgent need to commission, support, or advocate for more research that focuses on larger-scale and longer-term programmes that consider costs and/or cost-effectiveness, as well as scalability and sustainability. Policymakers and TPD implementers can support this by openly publishing a breakdown of costings. In addition, funders or global educational development actors can work on establishing protocols or standards for how to report on costs.

11. Coordinate and manage partners closely

To achieve the necessary coherence around national priorities, close coordination is needed between governments and partners, including implementers, sponsors, or TPD providers. A push to promote a culture of collaboration and learning across the TPD system would "avoid unnecessary duplication and help large-scale initiatives to learn from both mistakes and successes of small-scale pilot projects" (⇡Piper et al., 2015, p. 11). This serves to join up a disparate system of initiatives, actors, and funding.

Guidelines for how EdTech can be used for TPD in LMICs

If you want to use EdTech to…	Then this is suitable…	Try to avoid this…	Case study spotlight example
foster flexible learning environments	■ Hybrid or blended learning (i.e., in-person *and* remote/distance learning) (↑Widodo & Riandi, 2013: Indonesia ↑Onguko et al., 2013: Kenya) ■ Massive Open Online Courses (MOOCs) (↑Kennedy & Laurillard, 2019: Lebanon) ■ Virtual Learning Environments (VLEs), including Moodle, GoogleClassroom, etc. (↑Schreiber & Jansz, 2020: Sri Lanka)	■ Assuming teachers in the same contexts have the same access to technology or the same level of tech skills ■ Forgetting that access may require additional costs for mobile data, etc.	**jiFUNzeni in Kenya** (↑Onguko, 2012a; 2012b) ■ EdTech: solar-powered tablets, Open Educational Resources (OER), open-source software ■ TPD Activities: Teachers had opportunities to create multimedia resources (PDFs, video clips, podcasts, and images), either embedded in HTML content or electronically published. ■ Impact on Teachers: development and delivery of relevant content, use of cooperative learning, and activity-based learning strategies. Further research might investigate the impact for student learners.

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support teacher reflection	■ Videos for teachers to watch themselves or their peers teaching and offering feedback ■ Journals, e-journals, blogs, or forums ■ 'Structured reflection' — asking 'why' questions (↑O'Sullivan, 2002: Tanzania), linking to theory (↑Susantini et al., 2018: Indonesia)	■ Offering models to copy or overly scripted programmes / resources / lesson plans (↑Kotze et al., 2018: South Africa)	**OER4Schools in Zambia** (↑Haßler et al., 2018; ↑Hennessy et al., 2016) ■ EdTech: videos of interactive teaching by local teachers; built-in prompts for teachers and facilitators. ■ TPD Activities: Reflecting on videos, collaboratively designing and trialling new pedagogical strategies. ■ Impact on teachers: Teachers adapted to learners' knowledge, used more practical and group work. ■ Impact on students: Students collaborated, built deeper understandings of subject matter, and used digital technologies for problem-solving.
foster communities of practice	■ Social media: teacher-led (informal) vs. structured (formal, provided for teachers) ■ Apps or platforms that are familiar to teachers, e.g., WhatsApp, Facebook, e.g., for peer assessment of teaching materials: (↑Demir, 2018: Turkey) ■ Online discussion forums (↑Sun et al., 2018: China)	■ Misinformation spreading in CoPs that are not monitored for rigour in pedagogical principles (↑Manca & Ranieri, 2013: global) ■ Assuming that WhatsApp use for messaging develops digital literacy skills (↑Mabaso & Meda, 2019: South Africa)	■ See final example below for how a mobile mentoring TPD intervention helped to foster a community of practice between refugee teachers in Kenya (↑Mendenhall et al., 2018) and between refugee teachers and global mentors living in other countries. ■ Informal, innovative uses of social media include teachers sharing videos of themselves (e.g., ↑Makarani, 2012: India; ↑Osmanoglu, 2016: Turkey) trying out new practices and getting peer feedback.

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coach or mentor teachers	- Virtual coaching — Skype, video conferences - SMS messages and 'nudging' (↑Jukes et al., 2017: Kenya) - Dialogue between mentor and mentee - Create safe, trusting, low-stakes environment to foster reflection and feedback - Blended models; innovations include team-building resource kits sent to schools before virtual training sessions (Dignitas: Kenya)	- Losing sight of the social aspect of coaching / mentoring (this reduces efficacy) (↑Cilliers et al., 2021: South Africa) - High-stakes evaluation without ongoing formative evaluations and feedback	**Health and Literacy Intervention (HALI) in Kenya** - EdTech: Locally-sourced and accessed semi-scripted lesson plans and instructional materials; SMS support. - TPD Activities: Workshops and weekly text messages with new teaching ideas; bi-directional SMS model created a supportive community. - Impact on teachers: Change in classroom practices (e.g., more use of written text and a focus on letters and sounds). - Impact on students: Raised children's literacy outcomes after two years, and reduced school dropout rates (↑Jukes et al., 2017). However, the effect of using technology could not easily be isolated, as is common.
support pedagogical leaders	- Coaching tools and apps that offer structured guidance to coaches about what to do/ask (Inspiring Teachers: Uganda: ↑RTI International, 2018: Tanzania) - Data collection tools for classroom observations that take into account the diversity of learning contexts	- Coaching tools that make classroom observations more time-intensive (↑RTI International, 2018, Tanzania). - A rigid checklist that removes the diversity of learning	**Virtual coaching in Brazil** (↑Bruns et al., 2018) - EdTech: External expert coaching of the schools' pedagogical coordinators via Skype cost USD 2.40 per student. - TPD Activities: Secondary schools provided with virtual external coaching, classroom observation feedback, and self-help materials with tips on effective teaching. - Impact on teachers: Improved classroom effectiveness.

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and learners	contexts and learners	■ Impact on students: Student learning gains in mathematics and Portuguese.
support the most marginalised teachers	■ Provide resources (e.g., preloaded devices) in resource-constrained communities (↑Piper et al., 2015: Kenya) ■ Support second language learners, remote learners, learners with disabilities (↑Kok & Blignaut, 2014:Namibia)	■ One-size-fits-all programmes that make assumptions about resource levels, needs, and motivations (e.g., ↑Timperley et al., 2007): global)	**Mobile mentoring for refugees in Kenya** (↑Mendenhall et al., 2018) ■ EdTech: Teachers in refugee camps received mobile phones, data, and airtime. ■ TPD Activities: Over one year, teachers participated in workshops, virtual peer coaching and mobile mentoring. Peer mentoring fostered communities of learning and relationship building in the camp; global mentoring enabled two-way knowledge sharing as mentors were able to understand the context and tailor support. Mentors provided real-time responses to challenges and enabled feedback loops (both between mentors / mentees as well as project staff). ■ Impact on Teachers: Teachers reported using the mobile devices (a) to access the internet and engage in self-directed TPD, for example, to find content on how to support SEND learners, and (b) to share innovative teaching practices through photos or exemplar videos. Further research might investigate the impact for student learners.

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Further information

Read the full systematic review journal article here.

An associated technical report (⬆Hennessy et al., 2021) provides the quantitative outcomes from an initial systematic mapping review of the whole research field concerning use of EdTech related to teacher learning in LMICs (including teacher learning about technology that supports both student learning and teaching, planning and assessment practices). It includes information about regional distributions of the studies; TPD settings, audiences, and intended outcomes; design features of the TPD models and the tech devices and resources used; and contextual factors shaping the effectiveness, scalability, or sustainability of approaches.

The full database of 170 references with quality assessment and detailed thematic coding is openly available for others to conduct their own specific searches, for example by country or technology device. It includes a further set of 95 sources related to teacher learning and technology use for classroom teaching and learning, from the wider mapping review.

Contact details

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This bibliography is available digitally in our evidence library at
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