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Commonwealth Collaboration to Build Back Better

Paper by the Commonwealth Secretariat¹

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1. Introduction

The COVID-19 pandemic has exacerbated the global learning crisis, with many learners losing access to their classrooms. Recovery from the pandemic and transition back to regular schooling is slow, and there is a need to catch up. Despite some EdTech having been introduced as a mitigating measure, and despite some initial optimism, it is clear that the poorest children, especially, have missed significant learning. We must urgently reach every child and enable them to attend school; children must be supported to develop socio-emotional well-being and safeguard their mental health so that they are ready to learn; schools need to be effective places for learning and must focus on teaching the fundamentals first ([Annex 4.2](#)).

However, there are grounds for hope. The last two years of the COVID-19 pandemic, and indeed the recent decade, have provided ample insights and opportunities to learn from successes and failures, as illustrated by the evidence presented in the [Annex \(Section 4\)](#). In fact, arguably, we are closer than ever to being able to scale impactful and cost-effective interventions, at least in some areas.

This paper seeks to offer inspiration, overarching considerations, and research evidence to highlight opportunities for collaboration to ‘building back better’ – globally and within the Commonwealth. In particular, we consider opportunities related to the key theme of 21CCEM : ‘Rethinking education for innovation, growth, and sustainability post-COVID-19’. The overall theme combines lessons learnt from COVID-19 mitigation and recovery strategies; rethinking education for decent work and employability; redefining learning spaces: multiple pathways and flexible approaches; financing of education (including innovative financing); and education for sustainability and a peaceful, cohesive Commonwealth.

This paper consists of several sections. The next section ([Section 2](#)) provides no references to evidence; instead, it seeks to offer a narrative about the bigger picture – the forest, if you will. However, the [Annex \(Section 4\)](#) provides evidence through extensive references. The evidence provides offer ‘stories of possibility’ – examining the various trees in the forest. Naturally, this paper only offers one possible vision, and variations of this are of course also possible. What matters is that the Commonwealth community can not only arrive at a strong shared vision for approaching the UN Sustainable Development Goals (SDGs), but also collaborate to progress towards that vision.

2. An agenda for Building Back Better

Achieving learning outcomes for every child requires everyone to do more, to push harder. Financial resources are limited, and the UN Sustainable Development Goals were never within easy reach. Given the global recession of 2022 and beyond, the Sustainable Development Goals will be even harder to reach. To progress despite such constraints, some hard choices will need to be made. For some of these choices, evidence for implementation is available, but determining the effectiveness of other choices may be a more subjective process. To determine

appropriate interventions, let us consider the overarching characteristics of education interventions; education interventions that propel us towards the education goals of the Sustainable Development Goals – particularly so that the poorest have the opportunity of levelling up.

2.1. Characteristics of interventions

What, then, are the characteristics of interventions that could support development towards ‘rethinking education for innovation, growth, and sustainability post-COVID-19’, accelerating towards the Sustainable Development Goals? We propose the following five characteristics for what constitutes ‘effective’ interventions.¹ Interventions must

1. Enable holistic and relevant student learning;
2. Be affordable and cost-effective;
3. Be effective (also) for the poorest 30%;
4. Have impact, at scale, by 2030;
5. Have a tenfold impact (10x), not 10%.

As noted above, by ‘effective’, we mean interventions that will move us towards the Sustainable Development Goals. The first characteristic means that interventions have to **target student learning**, where such learning is relevant to the student. The word holistic refers to the idea that the shortest path towards say ‘foundational literacy’ does not depend on a single factor; interventions need to consider the emotional well-being of students so that they are ready to learn. For many students, relevant student learning means learning the basics: foundational literacy and numeracy. Without such gateway skills, other skills, such as digital literacy, cannot be acquired. Realistically, adjusting our goals towards 2030, ‘learning for all’ will mean ‘foundational learning for everyone’.

The second characteristic means that the cost of the intervention needs to be affordable. Available finance per student, not counting recurring costs, are less than USD10 / student / year in some Commonwealth countries. Therefore, interventions must be of comparable cost. However, the absolute cost of interventions needs to be considered relative to learning gains. Cost-effectiveness means that the **learning gains per unit cost must be favourable**. Suppose we use ‘learning adjusted years of schooling’ (LAYS) to assess learning; we may say that it is not LAYS alone that matter, but that the critical measure is ‘LAYS per unit cost’. This may mean that we may have to concentrate finances on fewer but more comprehensive interventions ([Annex 4.3](#)).

The third characteristic is a reminder that **interventions need to be effective for the poorest**. During the COVID-19 pandemic, many interventions were launched; however, because of an overreliance on technology, globally they reached only the

¹ These five characteristics were devised for a contribution to the IIMC webinar “Dealing with Online and Blended Education in Modern Challenging Times” 5th March 2022, Calcutta, India.
<https://www.iimcal.ac.in/iimc-webinar-dealing-online-and-blended-education-modern-challenging-times>

upper 50%-70%, leaving at least 30% without learning continuity ([Annex 4.2](#)). With new 'post'-COVID interventions, we have to make sure that the poorest 30% are included in the group of primary beneficiaries; the poorest have to be reached first, rather than being reached through future extensions at unspecified dates.

The fourth characteristic proposes a timeline according to which an intervention should show impact. Interventions must have realised their **impact by 2030**. Perhaps the eight years until 2030 seems rather generous; however, many interventions have limited impact and rely on 'later scaling'. For new interventions, we have to make sure that there is a credible Theory of Change that allows Characteristics 1-3 to be met by 2030.

The fifth characteristic pushes the boundaries in terms of effectiveness. It emphasises that to meet the Sustainable Development Goals, significant acceleration is needed. Many interventions will have some sort of impact. However, for children who are only achieving one year of learning in six years of schooling, an acceleration of 10% – 1.1 years of learning in six years of schooling – is not sufficient. We need to look at **interventions that can accelerate progress tenfold** (that is, 10X and by 1000%) rather than by 10%. Of course, although there are some, there are few single 'solutions' that have a tenfold potential. However, by combining the right interventions, and coordinating among implementers, it should be possible to drive up the impact factor.

For any given intervention, deciding whether or not these characteristics are met could potentially be a complex process, considering the large-scale mixed-methods assessments required as well as questions around replicability and implementation science. However, many decisions will need to be made without such tools at hand. In order to enable implementation decisions, we propose that an intervention should be considered to be effective if there is a defensible evidence-based Theory of Change, that indicates how five characteristics are met. We contend that a basic process like this will filter out a significant range of interventions and approaches. Once decisions on implementation have been made, and as interventions are implemented, we must progress cautiously; on the basis of monitoring, as well as rigorous research and evaluation, implementation decisions have to be constantly adjusted ([Annex 4.4](#)).

The deadline for the sustainable development goals is now 8 years away. To achieve significant progress, more coordination is needed, with a clear focus not just on what we aspire to, but also on what is achievable.

2.2. Areas within national systems of education

We now consider four areas within national systems of education, which we will use to organise the sections below. The first three areas are broadly self-explanatory:

1. Students and the classroom;
2. Teachers and the education workforce;
3. Administration of national education systems.

To this, we add a fourth area:

4. International collaboration.

Regarding international collaboration, we need to ask: What concrete options are there for Commonwealth countries to collaborate to accelerate progress towards the Sustainable Development Goals? Do the shared issues that groups of Commonwealth countries face have shared solutions? Consider, for example, the 21CCEM themes – what are the shared approaches that can accelerate learning?

The following sections examine each area in turn, suggesting approaches that meet the characteristics mentioned above and offer opportunities for collaboration.

2.3. Students and learning materials

One of the most significant opportunities for collaboration, which could bring significant cost savings, is sharing learning resources for school education. In the United States of America, the award-winning open-access Creative-Commons-licensed Illustrative Mathematics curriculum is used across 12 states, with a significant economy of scale ([Annex 4.5](#)). While the curriculum is aligned with the Common Core State Standards Initiative, each state has adapted the curriculum to suit its needs. The resources are not just a curriculum framework, but also a full set of resources, including classroom materials, resources for teachers and parents, as well as examination papers. Of course, international curriculum standards also exist, but there are no comprehensive open resources that can be adapted and utilised to implement those standards.

What if a group of Commonwealth countries cooperated to develop a shared, cutting-edge mathematics curriculum together?

What if a group of Commonwealth countries cooperated to develop a shared, cutting-edge mathematics curriculum together? This could be a fresh curriculum or could rework the curriculum resources of Illustrative Mathematics. This complete set of resources could be a ‘common wealth’, serving multiple countries. As with Illustrative Mathematics, the complete set of resources would be available in print, online, with play-based activities, and incorporating talk for learning, including (hyper-)flexible learning. A shared set of resources should also ensure accessible and inclusive learning opportunities ([Annex 4.14.1](#)), including opportunities for boys and girls ([Annex 4.7](#)).

While there is a need to improve mathematics achievement in its own right, there is another opportunity here. Mathematical thinking and computational thinking are closely aligned. What if a new curriculum, ‘counting and computing,’ incorporated mathematics but added computational thinking, starting in reception (early childhood) and continuing throughout primary to secondary? While many countries are improving reading achievements, rethinking education for decent work and employability also means improving achievement levels in mathematics and computing.

Concerning the five characteristics of interventions mentioned above ([Section 2.1](#)), we note that, while resources alone do not lead to improved student learning, it is

hard to see how effective learning can take place without learning resources. We estimate that moving towards an open model, say across five Commonwealth states, would result in significant cost savings and therefore much increased reach and scale. Providing resources in the form of printed textbooks where needed will reach the poorest, potentially providing every single child with the learning resources they need and paving the way for each learner to succeed.

Regarding digital resources at the student level, there is consensus within the research evidence. Unless sufficient access to technology and technological infrastructure is already present, EdTech does not offer viable interventions at the student level that meet the five characteristics, except for use of mass media (newspaper, radio, TV; [Annex 4.14](#)), inclusive teaching for disabled persons ([Annex 4.14.1](#)) and potentially for refugees ([Annex 4.14.2](#)). However, EdTech may offer viable approaches at the teacher level, at the level of national education systems ([Annex 4.14.3](#)) and for research ([Annex 4.14.4](#), [Annex 4.14.5](#)).

2.4. Teachers and teaching practices

The previous section considered the availability of resources, for the classroom but also for teachers, including for teacher continuous professional development (TCPD). However, resources are not sufficient: to improve teaching and learning, teachers must have opportunities for professional development. Indeed, many programmes have focused on TCPD in the past.

Effective classroom approaches are increasingly being codified (Structured Pedagogy, Teaching at the Right Level, the work of the Education Endowment Foundation in the UK and internationally; [Annex 4.6](#)). However, this is not the case for TCPD practices. Unfortunately, there are significant disparities between how TCPD is implemented and what is known about effective TCPD implementation ([Annex 4.8](#), [4.9](#)). This means that despite significant investment of financial resources in TCPD, there is little impact on learning outcomes.

Fortunately, effective evidence-based approaches are well documented, with new research evidence becoming constantly available, across a wide spectrum of settings. The issue is not one of the availability of evidence, but of the implementation of that evidence. A significant opportunity is coordinated action by various stakeholders as quickly as possible, to raise standards of TCPD implementation so that TCPD positively influences learning outcomes for students. To achieve this, sharing of TCPD materials, as well as better TCPD implementation standards, is needed. What if a group of Commonwealth countries shared TCPD materials and developed common standards for effective TCPD?

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Colleges of education ('teacher training colleges') need significant attention too. Often, teacher colleges are ineffective, utilising outdated curricula and approaches. As with continuing professional development, there are effective

approaches that could be utilised much more broadly. Additionally, the transition from college ('initial teacher education') to being a newly qualified teacher needs further attention ([Annex 4.10](#)). Overall, we need to redefine learning spaces not just for students, but also for teachers, allowing for multiple pathways and flexible approaches to becoming an effective teacher.

Teachers are of course not the only members of the education workforce, and other school leaders also need to have opportunities for professional development ([Annex 4.11](#)). Such professional development will transform school environments.

It is unequivocal that effective teachers are essential for enabling holistic and relevant student learning. While we need more teachers in many settings, many teachers have already been deployed. While more support for teachers is needed, many of them are already reaching many of the poorest. Investments in those teachers who teach the poorest will also reach the poorest learners. Given the disparity between the existing evidence for implementation compared to actual implementation, very significant gains in impact seem a very real possibility.

2.5. Administration of national education systems

The above sections are of course about areas that are part of national education systems. However, there are also opportunities in how administrations function. In light of recent technological advances, new opportunities are arising, which may well offer significant opportunities for acceleration towards the Sustainable Development Goals.

In particular, there are opportunities for technology use in education systems management, including better teacher allocation, better national-level coordination, as well as use of geospatial information. Some of those opportunities are already being realised in some Commonwealth countries and could also be applied to other Commonwealth countries ([Annex 4.14.3](#)).

Geospatial methods offer significant opportunities for increasing the efficiency of national systems of education.

In terms of the five characteristics of interventions mentioned above, data-based interventions can be cost-effective. Of course, such interventions require buy-in across national systems, which can be hard to achieve. However, particular approaches, such as geospatial methods and teacher allocation algorithms, require only very focused use of financial resources at critical moments of decision-making and benefit the poorest. For example, using geospatial methods to decide optimal locations for schools is a one-off investment; the funds needed to build the schools in one location rather than another is the same. Using such approaches, high-impact factors of over 10x have been achieved ([Annex 4.14.3](#)).

2.6. Commonwealth collaboration

In the previous sections, we made the case for increased cooperation, both globally and within the Commonwealth. There are significant opportunities for collaboration on openly licensed Global Public Goods: on classroom resources (Section 2.3), TCPD materials (Section 2.4), as well as sharing software (Section 2.5). As noted above, there are few open-structured classroom materials with relevant curriculum coverage; there are very few openly licensed structured TCPD programmes. Despite a renewed focus on Global Public Goods, the vast majority of investments lead to resources that are not shared.

What if Commonwealth countries worked together, ensuring that all donor-funded programmes always lead to openly licensed Global Public Goods? Within a few years – well before 2030 – the sector would be awash with resources for all possible uses within education. As we have noted above, there are significant opportunities for cost-savings and reach relating to the characteristics of interventions mentioned above.

What if Commonwealth countries worked together, ensuring that all donor-funded programmes always lead to openly licensed Global Public Goods?

Finally, we note that the agenda proposed here needs to be underpinned by evidence. However, primary research is expensive and multi-faceted. While better coordination of primary research is highly desirable, it may well be hard to do this. Furthermore, although there are evidence gaps where more research needs to be undertaken, there are also significant opportunities to aggregate or promote existing research outcomes. Compared to primary research, evidence synthesis is relatively easy to undertake. There are several organisations committed to aggregating research outcomes, such as the synthesis work of the Education Endowment Foundation, or the African Education Research Database by Education Sub Saharan Africa (ESSA). There are significant opportunities for research review, sense-making and meta-analysis, as well as understanding how such research findings support implementation decisions (Annex 4.14.5).

Commonwealth countries could work together to ensure that new research is widely circulated and appropriately synthesised. To make primary research more accessible, Commonwealth countries could encourage researchers to share research outputs under open licences. An effective approach to this could be through national research permits, granted by governments to researchers.

What if Commonwealth countries changed the rules of the research permits they granted, avoiding extractive research and promoting open access to evidence?

To avoid ‘extractive research’, research permits could stipulate that research should be published under open licences and that any research outputs resulting from a research permit need to be deposited with a national research archive. Such processes would ensure that research outputs become available much faster and in much greater numbers, without any significant cost implications for national administrations ([Annex 4.14.4](#)).

3. Conclusion

In this agenda for Building Back Better, we have covered the areas of students and learning materials, teachers and teaching practices, administration of national education systems, as well as opportunities for Commonwealth collaboration.

From a perspective of hope and optimism, we conjecture that we can construct high-impact interventions through such approaches, and ultimately achieve systemic changes. Such interventions could have significantly increased impact (10x), enabling holistic and relevant student learning, taking place in more affordable and cost-effective ways, reaching the poorest and doing so at scale.

In the annex to this paper, we substantiate this hope and optimism through evidence. While the evidence is tentative in places, we believe that it does offer a solid starting point to demonstrate that the agenda proposed in this paper may indeed be implementable.

4. Annex: Stories of possibility

We have deliberately kept Sections 1-3 in narrative form, without citations. In this annex, we now make good on providing evidence, both from literature reviews and from some noteworthy primary research. The annex is organised as follows: We describe our approach to literature discovery and review, followed by several sections providing evidence for the claims made in [Section 2](#). The relevant sections in this annex have been linked from [Section 2](#).

4.1. Approach and methodology

Our overarching research question is:

What does the current research evidence tell us about effective interventions that can be forged into larger holistic interventions, leading to effective and equitable transformation of national systems of education (cf. [Section 2.1. Characteristics of interventions](#))?

We approach this research not from a rigorous research perspective but rather from a ‘sense-making’ perspective. Education systems are under pressure to act: What recommendations can be made to accelerate the improvements needed, in the form of joined-up action (nationally and internationally)? [Section 2](#) outlines these recommendations. The sections below provide the evidence to support these recommendations.

Our approach to discovery was as follows. We selected the publications for this paper partially ‘intuitively’, based on our knowledge of the sector ([Haßler et al., 2021k](#)). We supplemented the intuitive selection with structured searches using Google Scholar. We used Google Scholar to search for literature reviews published since 2020 (Date filter: ‘since 2020’; keywords: ‘literature review’ plus words derived from the key themes, e.g., ‘education’, ‘sustainable education’). Given the association of the event with Commonwealth organisations, recent issues in JL4D were reviewed; JL4D is a peer-reviewed, open-access, fee-free journal, which encourages open preprints and is managed by the Commonwealth of Learning.

From this range of sources, approximately 200 publications were discovered, spanning primary, secondary, tertiary education, and lifelong learning. Following this acquisition of publications, the authors screened the publications in two rounds against relevance to the key themes and the title of this paper. Selection was also influenced by our desire to represent the geographic diversity of the Commonwealth. We note that the selection of publications for this publication is somewhat more subjective than it would be for a more formal literature review.

All references below are linked to bibliography records online, making publications easily identifiable. Our citation style partially follows the usual academic conventions, occasionally referring to papers by their full titles to aid recognition. Our [list of references](#) includes all cited publications.

4.2. The state of education in 2022

Released at 20CCEM in Fiji, the status update report [↑Sustainable Development Goal 4 in the Commonwealth](#), did – of course – not anticipate a global pandemic that would hinder progress towards the Sustainable Development Goals. Now, four years later, the recent report [↑Where are we on Education Recovery \(UNICEF, UNESCO & World Bank, March 2022\)](#) paints a bleak picture of the state of ‘post’-COVID-19 education in 2022. The foreword summarises the current state of education as follows:

“We know that even before the pandemic more than half of 10-year-olds in low- and middle-income countries were unable to read or comprehend a simple story. Now that figure is estimated to be as high as 70 per cent. This has been exacerbated by two years of COVID-19-related school closures, which have deepened education inequality. In fact, nearly 153 million children missed more than half of their in-person schooling over the past two years, with more than 62 million of them having missed at least three-quarters of in-person schooling. And we know that the most vulnerable children are paying the heaviest price, with evidence of disproportionate learning loss among children from disadvantaged backgrounds, children living in rural areas, children with disabilities and younger students.” (↑p. 5)

“As we look to the Secretary-General’s Transforming Education Summit in September, we call on governments to act on these alarming facts. It is our hope that they will come to the summit ready to report on how they have responded so far, and what they commit to doing next.” (↑p. 5)

The report exhorts governments to urgently work to reach every child and retain them in school; prioritise teaching the fundamentals and develop psychosocial health and well-being so that every child is ready to learn (↑p. 5). While governments are, of course, of critical importance in the education improvement process, we must exhort **all** actors in the sector, including not only governments, but also intergovernmental organisations, donors, programme implementation agencies, non-governmental organisations, research institutions, and researchers.

It is noteworthy that some of these outcomes of the report were anticipated, e.g., conceptually [↑A five-part education response to the COVID-19 pandemic \(Haßler et al., 2020i\)](#), then underpinned by emerging evidence ([↑Is there Learning Continuity during the COVID-19 Pandemic? A Synthesis of the Emerging Evidence, McBurnie et al., 2020](#)), followed by global analysis ([↑COVID-19: Are children able to continue learning during school closures? UNICEF, 2020](#)). In particular, [↑UNICEF \(2020\)](#) suggested that globally, 30% of children are not reached by learning continuity, with the percentage as high as 50% in sub-Saharan Africa.

However, rather than just affecting some regions, we note that differences in socio-economic status affect all countries, often in urban areas ([↑Urban poverty and education. A systematic literature review: Silva-Laya et al., 2020](#)), including the major cities of many Commonwealth countries. Moreover, COVID-19 has eroded progress that disadvantaged pupils may have made. For example, [↑COVID has](#)

eroded progress by disadvantaged pupils, according to a series of reports on [↑Pupils' progress in the 2020 to 2022 academic years Department for Education \(England, United Kingdom\)](#).

The view that evidence has been accumulating quickly is corroborated by Evans and Yuan (pre-COVID-19 pandemic):

“At the same time, evidence on what works to improve the quality of education is accumulating at an unprecedented rate (Figure 2). In recent years, hundreds of impact evaluations in low- and middle-income countries have demonstrated the effectiveness – or lack thereof – of a range of interventions at improving education outcomes, for girls and boys” (↑Evans & Yuan, 2019, p. 3; referencing Popova et al., 2018, and ↑J-PAL, 2017).

‘Post’-COVID-19 pandemic, many of the references in this report show how much evidence there is available.

4.3. Concentrating finances on more comprehensive interventions

The paper [↑Identifying the essential ingredients to literacy and numeracy improvement: Teacher professional development and coaching, student textbooks, and structured teachers’ guides \(Kenya: Piper et al., 2018a\)](#), based on some of the most rigorous evidence we have available, makes the point that the combined intervention of

“PD [teacher professional development] and instructional support, 1:1 revised books, and teachers’ guides was the most expensive, but that the additional impact on learning made this the most cost-effective intervention” (p. 342).

Intuitively, it is also clear that unless an intervention has significant impact, and unless it can transform the education system into a new state of operation, it will not be sustained.

What is needed is decisive coordination action that is capable of achieving significant impact. Given the lack of financial resources, this means that certain societal issues have to be tackled in turn, concentrating effort in order to make progress.

4.4. Systemic mixed-methods research

We noted above ([Section 2.1](#)) that as interventions are implemented, we have to process cautiously, employing monitoring, evaluation and research to validate implementation. For example, EdTech Hub puts forward a sequential mixed-methods approach that incorporates design-based approaches as well as systems thinking that has broader applicability beyond EdTech ([↑Haßler et al., 2021n](#)). Certain areas of knowledge may be considered as ‘emergent’ and require certain kinds of approaches to handle uncertainty ([↑Haßler, 2021m](#)).

4.5. Open curriculum-aligned teaching and learning materials

Globally, there are many Open Educational Resources (OER). However, historically, the OER movement has been focused on higher education. Resources for primary and secondary education are available, but typically as isolated assets, such as individual lesson plans. What is sorely lacking are open teaching and learning materials that are aligned with, and cover, diverse national curricula. International collaboration is needed in aligned resources with different curricula, as argued in [↑Why the World Needs a Curriculum Alignment Hub \(Chandra, 2020\)](#); also see [Groeneveld et al. \(2022\)](#).

One notable exception is [↑Illustrative Mathematics](#), offering a full K-12, Common Core aligned curriculum. The curriculum is problem-based, with a focus on ‘doing’, solving problems in mathematical and real-world contexts, and constructing arguments using precise language. The curriculum is licensed under Creative Commons Attribution and available in print and in digital formats.

As we noted above, we would not expect resources alone to have an impact, and it is certainly the case that effective teachers are needed to maximise impact. However, a

“new randomised trial providing textbooks together with a combination of financial and non-financial incentives to simply take the books home increased both language scores and the likelihood of students taking the end-of-year exam in the Democratic Republic of the Congo” ([↑Evans & Mendez Acosta, 2021](#), p. 33, citing [↑Falisse et al., 2019](#)).

The study was undertaken in primary schools. Falisse and colleagues note that

“The largest positive impact was found in schools with lower-quality teaching performance and for lower-ability students. Our results demonstrate that programs designed to intensify and diversify students’ use of existing school resources can sharply improve student achievement and career aspirations.” ([↑Falisse et al., 2019](#), p.1; also see:[↑Falisse et al., 2020](#)).

These findings underscore the importance of adequate resources for use both in the classroom and at home.

4.6. Effective classroom approaches

Effective classroom approaches have received significant attention in ground-breaking primary research ([↑‘Essential ingredients, Kenya: Piper et al., 2018a](#); [↑Teacher’s guides: Piper et al., 2018b](#); [↑Teaching at the Right Level: Banerjee et al., 2016](#)) as well as synthesis (e.g., [↑Cost-effective approaches to improve global learning: What does recent evidence tell us are “Smart Buys” for improving learning in Low- and Middle-Income Countries? World Bank, 2020](#)).

We also note that certain approaches take a holistic perspective, considering different areas in the education system: [↑Structured Pedagogy – How-To Guides](#)

and Literature Review (Piper, 2021a); moreover, this recent approach to Structured Pedagogy places a strong emphasis on operationalisation of research findings. In both respects, the approach aligns with Section 2 above. In the context of Africa, ↑Education in Africa: What Are We Learning? (Evans & Mendez Acosta, 2021) emphasises the impact of Structured Pedagogy as a combined intervention, alongside mother tongue instruction:

“New evidence shows promising impacts of structured pedagogy interventions (which typically provide a variety of inputs, such as lesson plans and training for teachers together with new materials for students) and of mother tongue instruction interventions” (↑p. 13).

Similarly, on achievement grouping, additional research evidence from Ghana has become available (↑Beg et al., 2020; ↑Duflo et al., 2021; cited in ↑Evans & Mendez Acosta, 2021).

In this section, we have focused on pedagogical interventions; arguably, these benefit most from collaboration among nations, and may be the most cost-effective as (at least some) teachers are already in place. However, Evans and Medez Acosta remind us that school feeding delivers gains in both access and learning, as well as the impact of eliminating school fees for primary and secondary schools (↑Evans & Mendez Acosta, 2021).

4.7. Interventions for girls and boys

A ↑UNESCO report published very recently (April 2022) provides evidence that gender-based inequality varies from country to country. While girls require continuing support, boys are at greater risk in some countries. The report notes:

“While girls continue to face severe disadvantages and inequalities in education, the report shows that boys in many countries are at greater risk than girls of repeating grades, failing to complete different education levels and having poorer learning outcomes in school. No less than 132 million boys of primary and secondary school age are out of school. They urgently require support.” (↑UNESCO, April 2022).

Supporting boys does not mean that girls will inevitably lose out. The report continues:

As this report shows, supporting boys does not mean that girls lose out and vice versa. Addressing boys’ disengagement not only benefits boys’ learning, employment opportunities, income and well-being, it is also highly beneficial for achieving gender equality and desirable economic, social and health outcomes.” (↑UNESCO, April 2022).

The issue of benefits derived from interventions that target boys vs. interventions that target girls is increasingly being discussed. The publication ↑What We Learn About Girls’ Education from Interventions that Do Not Focus on Girls: Evans & Yuan (2019) finds that:

There are also some interventions that offer interesting new avenues. For example, Ashraf and colleagues find that negotiation training for secondary school girls to advocate for their education improves educational outcomes ([↑Zambia: Ashraf et al., 2020](#)). A programme that provided bicycles to schoolgirls in Zambia reduced girls' commute time and their absenteeism from school, with modest impacts on mathematics learning ([↑Zambia: Fiala et al., 2020](#), cited in [↑Evans & Mendez Acosta, 2021](#), p. 37; published as: [↑Fiala et al., 2022](#)). Unlike a similar programme in India, the programme had no impact on dropout rates or grade advancement ([↑Evans & Mendez Acosta, 2021](#), p. 37 with reference to [↑India: Muralidharan & Prakash, 2017](#)).

4.8. More effective teacher professional development

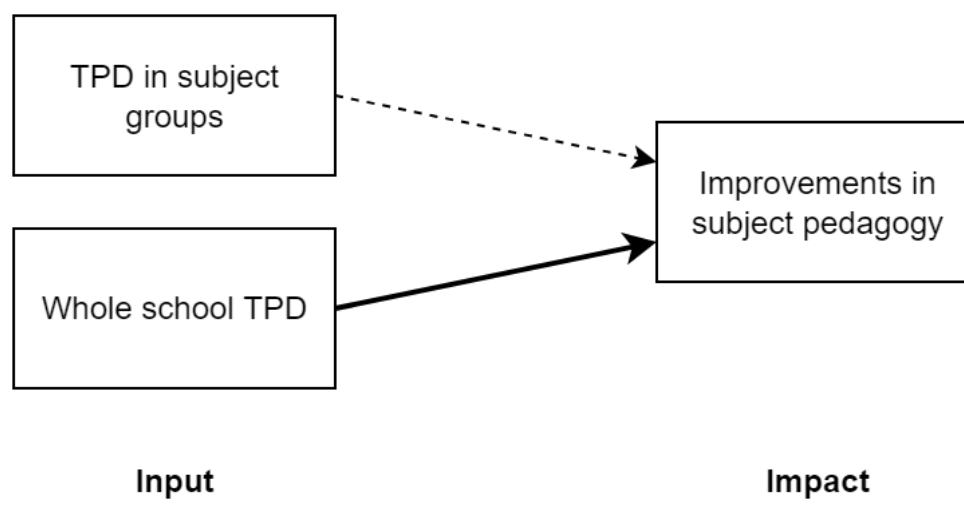
In [Section 2.4. \(teachers and teaching practices\)](#), we noted the discrepancy between how TCPD is implemented and what we know about effective TCPD. This is something of a tragedy because the discrepancy represents a significant missed opportunity. Research synthesis on TCPD – with technology ([↑D'Angelo et al., 2022](#); [↑Hennessy et al., 2022](#)) and without ([↑Allier-Gagneur et al., 2020](#); [↑Sims & Fletcher-Wood, 2021](#)) – is readily available from a large range of contexts. There is no doubt that teacher development is impactful. For example, the report [↑The Impact of Teacher Effectiveness on Student Learning in Africa \(Uganda\): Buhl-Wiggers et al. \(2017\)](#) estimates a lower bound on teacher effects, suggesting that gains through teacher performance are comparable to the most effective education interventions undertaken in Africa.

However, consistently closing the gap between evidence and practice, as well as evaluating teacher development to ensure successful implementation, is a significant challenge:

“The vast majority of at-scale teacher professional development programs in Africa (and elsewhere) go unevaluated in any serious way and many among those do not have the characteristics common to programs that have been shown to be effective” ([↑Evans & Mendez Acosta, 2021](#), p. 30, with reference to [↑Popova et al., 2018](#)).

A significant challenge is how to consistently translate available evidence into practice. Whether supported by technology or not, teacher education programmes need to deliver and structure content to develop reflective professionals with relevant pedagogical expertise. Some factors have been understood for many years, such as the need to provide opportunities for practice ([↑Allier-Gagneur et al., 2020](#)) and the importance of decentralised support (e.g., coaching: [↑South Africa: Cilliers et al., 2018](#); [↑Cilliers et al., 2020](#)).

However, some recent thinking also challenges pervasive practices, such as the perception that the need for ‘TCPD to focus on subject pedagogy’ necessitates ‘TCPD to take place in subject groups’ ([↑Haßler et al., 2021a](#); [↑Sims & Fletcher-Wood, 2021](#)). In terms of Theory of Change, the input of ‘TCPD in subject groups’ may not be the most effective way to ‘improve subject pedagogy’.



This insight challenges current practices of TCPD programming, but also offers significant opportunities for moving towards whole-school approaches ([↑Haßler et al., 2021a](#)).

For an upcoming programme on teacher development, see [↑Outputs register for a TCPD programme](#) (also see [Annex 4.14.4](#) regarding announcements for new research programmes).

4.9. Semi-structured school-based TCPD

We contend that, analogous with the discourse on Structured Pedagogy, including structured classroom practice, a ‘semi-structured pedagogy at the teacher level’ (for TCPD) may be effective. An exemplar of such a ‘semi-structured pedagogy at the teacher level’ is the OER4Schools model, which has now been trialled and adapted for over a decade: [↑Sustaining and Scaling Pedagogic Innovation in Sub-Saharan Africa: Grounded Insights For Teacher Professional Development](#).

Open Educational Resources have focused on classroom materials, but they can provide logically structured content for regularly scheduled school-based teacher and workforce education programmes. In Zambia, the OER4Schools programme developed openly licensed teacher professional development materials with session plans and exercises for 28 peer-led workshops on interactive subject pedagogy, questioning, group work, and Assessment for Learning ([↑Hennessy et al., 2014](#)). After completing the programme, participants increasingly adapted their teaching to students’ learning levels ([↑Hennessy et al., 2015a](#)).

Developed with some input from OER4Schools, the Roger Federer Foundation developed the iAct Android application to offer ongoing support to school-based communities of practice ([↑Roger Federer Foundation, 2016](#)). The application provides scaffolding for teacher-facilitators to organise and administer workshops on learner-centred teaching. Like OER4Schools, the application contains videos of interactive teaching – in Zambian schools – for professional development groups to watch and discuss. In teacher professional development sessions, videos can provide a tangible stimulus for critical reflection on instructional practice and negotiating complex classroom situations ([↑Marsh & Mitchell, 2014](#)). Teachers can also record and share videos of each other’s lessons to identify meaningful steps to

improve their practice ([↑Borko et al., 2008](#)). A recent evaluation, also in Zambia, found positive results ([↑Hoop et al., 2020](#); [↑AIR](#); [↑Hundred.org, 2021](#)). While the intervention is not publicly available, it appears to be based on [↑Mwabu](#), which is a successor to iSchool.zm. Initial input to OER4Schools, which had some overlap with OER4Schools ([↑21st century learning in Zambia – iSchool.zm and OER4Schools.org](#)). The OER4Schools materials have been adapted for use in secondary education in Zimbabwe ([↑Walker et al., 2022](#)), while they provided pedagogical insights for Transforming Teacher Education and Learning ([↑T-TEL Ghana – resource overview](#)). For future research in TCPD, see also [Annex 4.14.4](#).

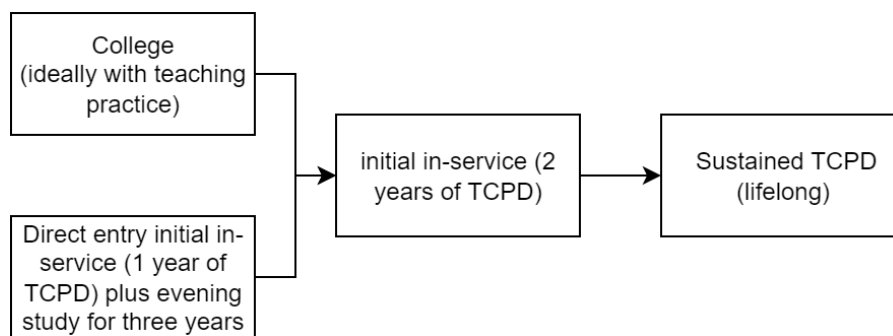
4.10. The role of colleges of education

Given the attention received internationally, one might consider college-based initial teacher education (‘pre-service’) to be the neglected sibling of continuing professional development (‘in-service’). However, between countries, the need for initial teacher education vs. continuing education varies ([↑Teaching and learning: achieving quality for all: UNESCO, 2014](#)). Moreover, given that many teachers do start out in teacher colleges, it is critical to make teacher colleges as effective as possible.

Transforming Teacher Education and Learning (T-TEL) started as a large-scale teacher college reform programme, focusing holistically on a broad range of areas, including pedagogy, leadership, administration, gender, teaching practice and – importantly – curriculum. Uniquely, it developed a comprehensive set of Open Educational Resources to support initial teacher education and college reform for Ghana’s 45+ public colleges of education. Similar to OER4Schools, a whole-college structured teacher professional development programme was developed, covering different pedagogical areas ([↑T-TEL Ghana – resource overview](#)), and used during college-based professional development sessions. During the first two years of programme implementation, the percentage of teachers using student-focused techniques rose from 26.1% to 65.9% ([↑T-TEL, 2017](#)).

It is important to note that, while developed digitally, the resources were printed for all tutors in order to ensure that all tutors had access. The role of open resources is not to facilitate digital access at the point of use, but to ensure reusability by other programmes; this, for example, contrasts approaches using Massive Open Online Courses (MOOCs), that have been less successful (e.g., [↑Buckler et al., 2021](#); also see discussion in [Section 2.3](#), as well as [Annex 4.13](#)).

A critical aspect that is sometimes raised, but not usually addressed, is the transition from teacher college to school, as well as flexible pathways. The following diagram illustrates a potential pathway for flexible entry into the teaching profession, including a structured transition into teaching.



Developing such new pathways does require rethinking the role of colleges relating to the lifelong learning of teachers. This is, of course, no easy task. However, colleges are already financed, including remunerated college teaching staff (lecturers, tutors); if the necessary professional development and incentives are offered, then – as with teachers – surely change is possible. We echo the sentiment of Buckler and colleagues, that:

“tutors working in colleges of education in sub-Saharan Africa are responsible for teaching, and inspiring hundreds of thousands of aspiring teachers, yet they have received little attention in the literature, often being depicted as a conservative cohort of professionals, unprepared for their role, yet resistant to change” (↑Uganda: Buckler et al., 2021).

Many tutors and teachers are highly engaged in their students learning and committed to their own development as educators. Programmes must create environments where education professionals can flourish.

4.11. Strengthening leadership

Leadership needs to be strengthened at all levels. ↑A review of empirical research on school leadership in the Global South low- and middle-income countries (Global School Leaders, 2020) investigates, among other areas, the relationship between school leadership and student outcomes, and the availability and impact of training programmes that aim to improve school leadership skills and student outcomes (↑p. 3). Unsurprisingly, *“school leaders are largely tasked with administrative responsibilities, resulting in often spending less than 25% of their time managing activities related to student learning”* (↑p. 3). However, the report suggests that the following are focus areas that can be effective at improving student outcomes (↑p. 4):

1. Programmes focused on supporting school leaders in their use of student-level learning data;
2. Programmes working with government schools that focus on school leaders’ teacher development activities as the main channel through which they can influence student mathematics and literacy outcomes;
3. Programmes that incorporate coaching of school leaders to complement traditional training models.

Improved school leadership, and indeed, improved education system leadership at regional levels, is critical to leverage the broader education workforce for better learning and more resilient education systems ([↑Education Commission, 2019](#); [↑Global School Leaders, 2020](#); [↑Mlambo et al., 2020](#); [↑Naylor et al., 2019](#); [↑Save Our Future, 2020](#)). Practical examples for leadership from the Caribbean include support for education ministries ([↑OECS, 2021](#)) as well as school leaders ([↑CARICOM, 2021](#)).

4.12. Learning partnerships

In this paper, we have not focused much on parents and caregivers. However, parents and caregivers have made critical contributions to their children's learning. While parents and caregivers are often portrayed as not being engaged in the education of children, there are many findings to the contrary. An interesting paper in this regard, which illustrates some of the decision factors in parents' choices, is [↑What Do Tanzanian Parents Want from Primary Schools—and What Can Be Done about It? \(Solomon & Zeitlin, 2019\)](#). The researchers found that parents' choices are driven by proximity and learning quality, with class sizes or infrastructure quality playing a lesser role.

We should also note that the impact of stress is an important factor in education, and we recommend [↑The impact of stress on students in secondary school and higher education \(Pascoe et al., 2020\)](#) and [↑COVID-19 employment stress and child vulnerability \(Noble et al., 2020\)](#).

4.13. Collaboration: Global Public Goods

An important area for collaboration is the joint development of Global Public Goods. Areas including classroom resources, teacher development, and leadership development strongly benefit from the availability of high-quality resources, including teaching and learning materials. In the background paper [↑EdTech and COVID-19 response for ↑Save Our Future \(2020\)](#), we put forward suggestions regarding collaboration on open content and Global Public Goods for teaching and learning:

1. National governments to use open curricular content and to ensure that there will be low- or no-cost ways for teachers, parents, and students to access content digitally, offline, through radio, through television, or in print.
2. Multi- and bilateral organisations, national governments, and the private sector to co-create mechanisms to share openly licensed, printable and editable content for the core curriculum including teacher guides, structured lesson plans, textbooks, workbooks, teacher professional development materials, and other multimodal resources in accessible, user-friendly formats and local languages, and targeted by learner level, for use inside and outside of the classroom.

These suggestions relate directly to our narrative in [Section 2.3](#), with specific reference to the [Math Curriculum by Illustrative Mathematics](#) as a set of resources that can be readily aligned.



4.14. Technology use in education

Because technology use in education (EdTech) has received significant attention during the COVID-19 pandemic, this section and subsections focus on this topic. While EdTech can be impactful we need to be aware that that *“education technology interventions have decidedly mixed impacts”* ([Evans & Mendez Acosta, 2021, p. 13](#)).

One of the conditions for EdTech appears to be that existing infrastructure is needed to make it work cost-effectively:

“While the findings are certainly not universally positive, they suggest that technology in education can effectively complement or substitute for existing inputs when the infrastructure is in place to support it” ([Evans & Mendez Acosta, 2021, p. 13](#)).

Therefore, it would be fair to say that infrastructure for entire national education systems should not come out of education budgets (e.g., using the rationale of enabling EdTech). If infrastructure is commercially feasible, for example to enable business services, then this infrastructure can also be used for educational purposes.

If infrastructure in a certain domain is not already available (e.g., students do not have devices) then attempts to use EdTech in that domain will fail (i.e., will not improve student learning outcomes).

Specifically, we may say that if infrastructure in a certain domain is not already available, then attempts to use EdTech in that domain will fail. For example, if students do not have devices already (including a supporting infrastructure), then trying to introduce devices will not improve student learning outcomes. However, if headteachers **do** have regular access to devices (perhaps non-smart phones), the interventions can utilise those resources.

The process of developing Theories of Change means mapping out likely pathways to impact. Of course, any particular Theory of Change can be debated regarding the validity of evidence. However, within EdTech, often the assumption seems to

be made that as long as an intervention works at a small scale, it will be possible to somehow scale-up the intervention. This assumes for instance that somehow deployment of technology at scale will be easier. While this is true in some cases, there are also other costs that only occur at scale. In any case, even where costs reduce at scale, the cost reductions are usually small (say 10% cost reduction) compared to the reduction in cost that would be needed (say 90% cost reduction).

Consider student use of tablets. Costs in pilots (with smaller numbers of students) are typically between USD 50-100 / child / year (e.g., the cost of a tablet replaced every three years). To meet available finance, the cost would need to be reduced by a factor of 10 to about USD 5-10 / child / year to be affordable at scale for the lowest-income countries. It is unlikely that any scaling of technology would reduce costs that much over the next 8 years.

One exception to this analysis is the absolute cost, which is important. For example, in small island states, where only (say) 10,000 children are in school, purchasing 10,000 tablets (at a cost of USD 1m / year) might be feasible. However, for larger countries, say with 1,000,000 children, the cost of USD 100m / year exceeds even the most generous aid budget.

Such considerations also mean that technology-supported, individual, personalised learning needs to be regarded with extreme caution. It seems clear that personalised learning only offers limited learning gains, which, combined with the high costs, mean that such interventions are not favourable for low-income countries (↑[Bettinger et al., 2020](#); ↑[Bhutoria & Aljabri, 2022](#); ↑[Major & Francis, 2020](#)). Of course, according to the analysis in the paragraphs above, this means that if budgets per child are several USD 1000 / child / year (as they are in higher income countries), then technology is likely available already, and a few hours of personalised learning is a useful addition to a broad range of learning activities.

To summarise our argument, we may say that unless there is an obvious pathway to scale (such as existing devices), there is no pathway to scale. Experience over the last two decades unequivocally shows that a ‘waiting-to-be-discovered magic wand’ that will ‘solve’ education issues with one simple stroke simply does not exist.

**Unless there is an obvious pathway to scale,
assume that there is no pathway to scale.**

However, this does not mean that we cannot use EdTech at all – it just means that we should not use EdTech in certain domains. There are several areas where EdTech can be extremely useful and support learning outcomes. In such instances, we should not consider using the most innovative and highest risk technology, but rather consider tried and tested approaches, with solid Theories of Change. For example, in India, the Technology Tools for Teaching and Training programme used interactive radio instruction and educational television, reaching 40 million learners (↑[USAID, 2010](#); improved learning outcomes in English, mathematics, and environmental science: ↑[Carlson, 2013](#)).

Safe bets for using EdTech for the most marginalised settings appear to be:

1. **Students and classrooms.** Mass-media, no-tech, low-tech (print, radio, TV; e.g., Ubongo Kids).
 - a. **For students with disabilities,** higher-tech solutions may be an option, as reaching scale and costs present differently (see [Annex 4.13.1.](#)).
 - b. **For refugees,** higher-tech solutions may be an option, depending on the precise settings (see [Annex 4.13.2.](#)).
2. **Teachers / schools / education workforce.**
 - a. **Teachers.** Mass-media (print, radio, TV), perhaps including lower-tech mobiles devices, e.g., KaiOS phones with messaging apps / WhatsApp / Telegram / Signal; lower-cost Android phones with messaging apps; offline content; video).
 - b. **Selected teachers and headteacher.** Headteachers and selected teachers (heads of departments, specialist teachers, school-based peer facilitators) are more likely to have devices.
3. **Technology use at the national level** (see [Annex 4.13.3.](#)).
4. **Technology use for research and cooperation** (see [Annex 4.13.4.](#)).

We note that interventions with Global Public Goods, may have digital and non-digital components. For example, as coordinating the development of books / teaching and learning materials, is ‘digital intervention’ at the level of (say) intergovernmental organisation (‘book creation’), while being a mass-media intervention at the student / school level (printed books). We advise, once again, to temper the impulse to use digital resources (e.g., Massive Open Online Courses, MOOCs) directly at the teacher level; the evidence suggests that this is not likely to be successful for the most marginalised students. For recent insights, see for example, [↑When the Trainer is Untrained: Stakeholder Incapacitation in Implementation and Utilisation of Open Educational Resources in Kenya \(Kinyua, 2021\).](#)

We also note two relatively recent reviews: [↑Realizing the promise: How can education technology improve learning for all? \(Ganimian et al., 2020\)](#) and [↑Education technology in developing countries: A systematic review \(Rodriguez-Segura, 2020\).](#) Relating to Structured Pedagogy ([Annex 4.6.](#)), we recommend [↑Structured Pedagogy and EdTech \(Adam et al., 2021\).](#) More generally, the evidence library of the [↑EdTech Hub](#) collates work on EdTech.

4.14.1. EdTech: Inclusion and special educational needs

[Section 2](#) only mentions inclusion in passing, and we devote more space on inclusion and special educational needs and disability (SEND) here. In particular, EdTech may have a significant role to play for learners with SEND. However, the digital divide (divisions of income and geography) is as present for learners with SEND as it is for their peers without SEND. Worldwide, only 10% of the one billion people who need assistive devices have access to them (WHO, 2019, as cited in a

recent review: [↑Educational technology for learners with disabilities in primary school settings in low- and middle-income countries: a systematic literature review: Lynch et al., 2022](#)).

The academic field of disability and EdTech is mostly lacking in rigorous evidence-based research ([↑Lynch et al., 2022](#)). Often, papers are only able to draw on anecdotal evidence. Also, the field is dominated by studies that focus exclusively on the short-term goals of providing hardware to learners, *“with little reference to pedagogy or the national curriculum,”* or using EdTech to support factors of entry into learning with little exploration of

“the impact of these interventions on children’s engagement, levels of independence and their participation within school settings” ([↑Lynch et al., 2022](#)).

In the research, learners appear to be treated as passive subjects to be researched, rather than as active subjects that can participate in the research design.

However, despite the persistent inequality in access and the field’s state of evidence, we should find hope in several creative uses of EdTech in response to the COVID-19 pandemic. In particular, the relative shift away from PCs and the proliferation of mobile technologies, especially Android phones, present new opportunities for the use of EdTech to provide learning opportunities to children with SEND. For example, a low-cost application (mBRAILLE) on an Android mobile phone was used in Bangladesh to teach writing in Braille; the innovation might have significant implications, given that traditional assistive technology (AT), such as Braille frames and styluses, continues to be too expensive for many in Bangladesh ([↑Nahar et al., 2015](#)).

A study which measured the impact of using tablet computers on the learning outcomes of 40 learners in India and the UK reported faster learning rates for learning how to operate the device, in comparison to the use of television; the study found generally positive feedback from the learners themselves who appreciated the device’s multifunctionality ([↑Gothwal et al., 2018](#)). Other recent interventions utilise a range of technologies from virtual reality to social media ([↑Hu & Han, 2019](#); [↑Zahra et al., 2018](#)). Further details of relevant research are available in [↑Lynch et al. \(2022\)](#).

Finally, we highlight the UNICEF Accessible Digital Learning Portal featuring the Kenyan [↑Digital story time \(eKitabu\)](#).

4.14.2. EdTech: Opportunities for refugees

The rapid evidence review by Ashlee and colleagues on refugee education provides a useful starting point ([↑Ashlee et al., 2020](#)). The reviews of recent publications on EdTech and refugees found that the literature is unanimous in the assessment of the state of EdTech infrastructure. Studies have found that EdTech infrastructure available to refugees, including internet connectivity and electricity, is generally poor. The state of EdTech infrastructure is, on the whole, as poor in urban centres where refugees live as it is in refugee camps ([↑Ashlee et al., 2020](#); [↑Taftaf &](#)

Williams, 2020). As a general rule, however, writings on EdTech and refugees over the past couple of years focus disproportionately on refugee learners who reside in refugee camps (↑Lebaron von Baeyer, 2018; ↑Taftaf & Williams, 2020; ↑UNESCO, 2018; ↑Wagner, 2017).

There have been a number of EdTech interventions have been used to provide learning to refugee children before and during the COVID-19 pandemic. EdTech interventions for refugees have more often than not been afflicted by two main problems. First, while Edtech implementers understand the importance of aligning EdTech content so that it is contextually and culturally relevant to learners, this is often not the case in actual practice (↑Ashlee et al., 2020; ↑Joynes & James, 2018; ↑Lewis & Thacker, 2016; ↑UNESCO, 2018). Second, most EdTech interventions prove prohibitively expensive (↑Ashlee et al., 2020; ↑Burde et al., 2015; ↑Carlson, 2013; ↑Lewis & Thacker, 2016; ↑Tauson & Stannard, 2018; ↑UNESCO, 2018), despite suggestions that it is possible for EdTech interventions to be judicious investments depending on the type of EdTech that is used. Mobile phones have been singled out as particularly cost-effective, especially where EdTech interventions build on existing mobile phone devices and usage among refugees (↑Ashlee et al., 2020; ↑Ashlee et al., 2020; ↑Tauson & Stannard, 2018; ↑UNESCO, 2018).

Researchers are nonetheless hopeful that there is real potential for the use of EdTech to increase refugees' access to learning, but only if EdTech is used as part of a holistic approach to learning (↑Lewis & Thacker, 2016; ↑Taftaf & Williams, 2020; ↑UNESCO, 2018; ↑Wagner, 2017). Some recent reports of EdTech interventions among refugees have been relatively effective in improving the learning outcomes of refugee learners, and educators are beginning to better understand what exactly a holistic approach to educating refugees would look like. These Inspiring Girls Enjoy Reading (TIGER Girls), for example, is a programme providing Syrian refugee adolescent girls of secondary school age who live in the Za'atari refugee camp in northern Jordan with access to digital content and open learning opportunities (↑UNESCO, 2018; ↑Wagner, 2017). Other initiatives worth noting include KA Lite (↑Dahya, 2016); Kolibri and Learn Syria (↑Lewis & Thacker, 2016); the Raspberry Pi for Learning Initiative used by UNESCO in Lebanon (↑Lewis & Thacker, 2016); two smartphone apps, Antura and the Letter and Feed the Monster, to improve the literacy of Syrian refugee children in Jordan (↑UNESCO, 2018); and the use of WhatsApp in Teachers for Teachers, a teacher professional development project implemented in Kakuma refugee camp in Kenya (↑Tauson & Stannard, 2018; ↑UNESCO, 2018).

The three main challenges which implementers of EdTech interventions face when working in refugee contexts are inadequate infrastructure, lack of alignment between EdTech content and learners' previous curricula and present contexts, and exorbitant costs. Open education resources (OER) have the potential to be a cost-effective way of increasing refugee children's access to learning opportunities (↑Lewis & Thacker, 2016; ↑UNESCO, 2018). In order for OER to fulfil this potential, high-quality OER content needs to be aligned to a curriculum which provides refugees with learning continuity and is culturally relevant to them. That is not where we are today (↑UNESCO, 2018). Instead of the "*Northern-driven and decontextualized interventions*" that almost monopolise the landscape today

(↑[Menashy & Zakharia, 2019](#)), what if we were to convene OER curriculum-alignment “*camps*” for teachers working with refugee learners, relying on local capacities to create relevant EdTech content (↑[Lebaron von Baeyer, 2018](#); ↑[Taftaf & Williams, 2020](#))? OER can be used with low-tech devices, such as a WhatsApp-capable low-cost mobile phone, to design and implement holistic EdTech interventions in refugee contexts.

4.14.3. Technology to optimise spending in national education systems

We might say that EdTech, or technology use in education, comes into its own when we consider options for managing the national education systems (this section) as well as options for research and collaboration (next two sections).

A range of pedagogical and other factors need to be in place to make education systems effective. Evidence is available that shows promise – “*from a range of teacher programs, including both remunerative (pay-for-performance of various designs) and non-remunerative (coaching and certain types of training) programs*” and the elimination of school fees (↑[Evans & Mendez Acosta, 2021, p. 13](#)). However, one of the challenges in the administration of national education systems is financing.

More funding is needed. However, given the ‘post’-COVID-19 recession, it is unlikely that significant additional funding to reach the Sustainable Development Goals will be made available. In this section, we focus on resource allocation. Given the characteristics for interventions mentioned in [Section 2.1](#), we do not only ask whether there is scope for optimisation, but whether there is scope for optimisation *without* negatively affecting learning outcomes.

This is not paradoxical: For example, we have argued that TCPD programmes could have much improved learning outcomes, while keeping the investments constant. Here we ask whether we can maintain parameters relevant for learning outcomes (such as access), while reducing costs. One area that has significant promise is the emerging area of geospatial analysis in education.

For example, in the Guatemalan context, Rodriguez-Segura and Kim argue that a 20-fold optimisation may be possible:

“350 optimally-placed schools had the same impact on the share of population in an education desert as the 7070 schools actually built between 2008 and 2017. We take this finding as especially hopeful and actionable for policymakers because it roughly indicates that - at least in the Guatemalan context - substantial strides in physical access can be made even if only one in 20 schools are constructed with physical access in mind.”
(↑[Guatemala: Rodriguez-Segura & Kim, 2021, p. 10](#))

In other words, it may be possible to achieve a 20-fold improvement (in this specific context). Suppose there is a fixed budget for an activity; a 20-fold cost saving could mean that outcomes can be achieved for 1/20 of the budget, while the remaining 19/20 of the budget are freed up and can be reallocated to other initiatives. However, we can also look at this in terms of reach. Suppose we only

have funding for 350 schools. In a non-optimised way, these schools might only cover 1/20th of the population; however, in an optimised way, these 350 schools might cover the entire population.

There are other examples for such kinds of optimisation, including examples from high-income countries. In an example from France, Combe and colleagues explore how teachers could be placed closer to their families, leading to greater job satisfaction ([↑France: Combe et al., 2020](#)). Such approaches could be used in lower-income countries, where teacher turnover is a challenge ([↑Rwanda: Zeitlin, 2021](#)). The GIS for Education Working Group was established to support stakeholders in actualising the potential of geospatial data in education ([↑the Education Commission, 2021a](#); [↑the Education Commission, 2021b](#); [↑the Education Commission, 2021c](#)).

Of course, how to optimise spending in national education systems is not a simple task. Nevertheless, the examples above show that significant optimisation may be possible in some cases.

For an upcoming programme on geospatial methods in teacher allocation, see [↑Outputs register for a teacher allocation research programme](#) (also see [Annex 4.14.4](#) regarding announcements for new research programmes).

4.14.4. EdTech and research: Open access

We have already suggested that adjustments to research permits ([Section 2.6.](#)) would make more research available. In this section, we discuss the relevance of preprints. One of the desirable characteristics for interventions we outline ([Section 2.1.](#)) is that they would need to be effective and reach scale by 2030. As ‘being effective’ relies on evidence, it is therefore important for evidence to be available as quickly as possible.

From a health perspective, preprints and working papers played a significant role during the COVID-19 pandemic ([↑Fraser et al., 2021](#); [↑Johansson & Sadari, 2020](#); [↑Vlasschaert et al., 2020](#)). However, in education, the use of pre-prints remains very limited, locking knowledge sometimes for years before it can be used for decision-making. While some funders now mandate open access publication, we can go further by also mandating public preprints, as well as publishing of research instruments. This could significantly speed up the time for making evidence available.

For example, in 2018 Cilliers and colleagues initially published a working paper ([↑Cilliers et al., 2018](#)) while the research was only published in a journal in 2020 ([↑Cilliers et al., 2020](#)). Not only was the working paper made available sooner, but it is also openly available.

What if evidence could become available two years earlier than it currently does?

Many journals do not allow public preprints or working papers; however, this is a situation that is quite unique to certain areas of research, and not a necessity by

any means. This can be changed through collective action ([Section 2.6.](#)). Making evidence available sooner will help to accelerate implementation of effective strategies to achieve SDGs by 2030; publishing research instruments would also support national research operations through reuse and adaptation of research outputs. A related issue is the coordination of future research. For example, for a programme for which funding has just been committed, or for a programme that is just starting, how reliably cite the programme as well as obtain updates? One possibility is the use of output registers, with details planned outputs. The outputs register can have a Digital Object Identifier, such as for this programme on teacher professional development ([↑Outputs register for a TCPD programme](#), also see end of [Annex 4.8](#)) or for this programme on geospatial methods in teacher allocation ([↑Outputs register for a teacher allocation research programme](#), also see end of [Annex 4.14.3](#)). These programmes are now citable, allowing the sequence of outputs to be inspected by other parties. This process is similar to pre-registering trials, but, given the focus on the programme as a whole, rather than a trial, with a lower threshold in terms of the formalities needed.

Cooperation in this area will not only get more research findings into circulation, but also support evidence synthesis and uptake ([↑All Programmes Recorded, All Outputs Reported](#)).

4.14.5. EdTech and research: Evidence observatory

The sector, as well as the current paper, benefit from powerful examples of evidence synthesis. For a deeper exploration, we highly recommended the global work by Bond and colleagues focusing on the COVID-19 pandemic ([↑Schools and Emergency Remote Education during the COVID-19 Pandemic: A Living Rapid Systematic Review: Bond, 2020](#); [↑Global emergency remote education in secondary schools during the COVID-19 pandemic: Bond et al., 2021](#)), as well as the work by Evans and colleagues ([↑Education in Africa: What Are We Learning? Evans & Mendez Acosta, 2021](#); [↑Popova et al., 2018](#)); also see [Annex 4.15](#).

However, such reviews tend to capture a specific moment in time, while ‘living reviews’, offering continuous aggregation and synthesis of evidence remain elusive. We noted in [Section 2.6](#) that compared to primary research, evidence synthesis is relatively easy to undertake. Further, we noted that there are several organisations committed to aggregating research outcomes, such as the synthesis work of the [↑Education Endowment Foundation](#), or the [↑African Education Research Database](#) by Education Sub Saharan Africa (ESSA). Such initiatives are already active in multi-country collaborations, and such collaborations could be strengthened, particularly through engaging more Commonwealth researchers in evidence synthesis.

For this to work effectively, a supply of suitably qualified researchers who understand implementation and can apply evidence to implementation is needed.

What if Commonwealth universities had a shared masters programme on EdTech,

educating the next generation of researchers and evidence-implementers?

There is of course also a need for primary research: While more evidence has become available, more evidence with cost assessments is needed ([↑Evans & Mendez Acosta, 2021](#)).

4.15. Reviews supporting 21CCEM themes

In this final section, we present additional research, broadly organised under headings relevant to the 21CCEM themes.

4.15.1. Reviews related to the COVID-19 pandemic

In this section, we present reviews related to education during the COVID-19 pandemic.

[↑Schools and Emergency Remote Education during the COVID-19 Pandemic: A Living Rapid Systematic Review \(Bond, 2020\)](#) offers a rapid systematic review synthesising K-12 research on teaching and learning during the COVID-19 pandemic, based on English-language publications. Recommendations from the literature include *“providing further funding for professional development and equipment, prioritising equity, designing collaborative activities, and using a combination of synchronous and asynchronous technology”* ([↑Bond, 2020](#), p. 191). The review recommended that given *“the gaps identified in this review, future research is encouraged into triangulating the experiences of students, particularly primary school aged and disadvantaged populations (including SEND students), with those of parents and teachers”* ([↑Bond, 2020](#), p. 216).

[↑Global emergency remote education in secondary schools during the COVID-19 pandemic \(Bond et al., 2021\)](#) notes that *“while online peer collaboration was primarily facilitated through video conferencing systems (Google Meet, MS Teams and Zoom), some alternative methods emerged, such as: involving students in an online group campaign and using social media production, [...] using discussion boards to facilitate one-to-one sharing of ideas and conduct school work with peers [...]”* ([↑Bond et al., 2021](#), p. 34). While new approaches were identified, some approaches remained traditional; *“for example, the comment feature and/or ‘suggesting mode’ in Google applications enabled a simple form of peer feedback and collaboration”* ([↑Bond et al., 2021](#), p. 34). Bond and colleagues continue:

“Using Google applications for learning may be considered traditional, as Google documents have been used for peer collaboration in classrooms for more than a decade [...]. However, it may have been perceived as new if students had not used this tool from home before [...].”
([↑Bond et al., 2021](#), p. 34)

[↑A global outlook to the interruption of education due to the COVID-19 pandemic: Navigating in a time of uncertainty and crisis \(Bozkurt et al., 2020\)](#) notes that

“one of the biggest silver linings of Covid-19 has been the turn towards open educational practices and open educational resources, both at a school and university level. However, note that this is not to be confused with “free” content that is being made available temporarily by publishers on their websites, but refers to resources that can be legally reused, revised, remixed, redistributed and retained” (↑[Bozkurt et al., 2020](#), p. 7).

At a university level, *“the Commonwealth of Learning (2020) has launched a partnership with over 44 universities and educational institutions (the majority being open and distance learning institutions) to collaboratively work on supporting learning throughout the crisis.”* (↑[Bozkurt et al., 2020](#), p. 7)

↑[COVID-19 and teacher education: a literature review of online teaching and learning practices \(Carrillo & Flores, 2020\)](#) note that in

“the development of online activities, an optimal level of social presence by instructors was shown to be essential in achieving participation, collaboration and fostering the cohesion of the learning community [...]: highly active instructors supported other members’ participation in online communities, but also dominated the discussion and left limited room for student participation” (↑[Carrillo & Flores, 2020](#), p. 471)

The review also reaffirms the important role of video of authentic classroom situations:

“Within and outside these online communities, videos of real classrooms were outstanding tools to drive teacher reflection [...], obtain practical knowledge about the profession [...], and connect with course content in a practical way [...]. The most practical videos within authentic classroom situations [...] promoted the highest levels of teacher reflection and knowledge development. They supported students in accessing a range of classroom practices in a safe environment (observation), linking theory and practice in a supportive setting (contextualisation), supporting professional dialogue through the joint construction of knowledge (reflection) and developing critical personal teaching practices (action) [...]” (↑[Carrillo & Flores, 2020](#), p. 473).

↑[Using EdTech to Support Learning Remotely in the Early Years. Rapid Literature Review of Evidence from the Global Response to COVID-19 \(Korin, 2021\)](#) notes that early childhood education in LMIC contexts is under-invested and under-researched (face-to-face and remote); Korin notes that *“very little is known about remote interventions in the early years across all sectors of early childhood development (ECD), including early childhood education”* (↑[Korin, 2021](#), p. 10).

↑[Support provided for K-12 teachers teaching remotely with technology during emergencies: A systematic review \(Crompton et al., 2021a\)](#) focuses on ‘emergency remote education’ from 2010 to 2020, focusing on 57 studies. Crompton and colleagues note that *“it was positive to see that there were more studies with the main focus on digital pedagogical strategies (11) than technology tools (4)”* (↑[Crompton et al., 2021a](#), p. 11).

↑[Learning with technology during emergencies: A systematic review of K-12 education \(Crompton et al., 2021b\)](#) uses a similar approach to the previous review (↑[Crompton et al., 2021a](#)), but seeks to determine how technology has been used to continue K-12 learning remotely during an emergency. From the same period (2010-2020), 60 articles from 48 countries were included. The authors included *“implications for practice and/or policy Recommendations regarding emergency remote education are provided in this paper that will be of benefit to K-12 teachers, school leaders, policymakers, and funders in the continuing COVID-19 pandemic and future emergencies”* (↑[Crompton et al., 2021b](#)).

↑[A Roadmap for Measuring Distance Learning: A Review of Evidence and Emerging Best Practices \(Morris et al., 2021\)](#) seeks to encourage education practitioners, donors, and other stakeholders in *“applying best practices to monitor and evaluate distance learning initiatives designed for diverse learners and implemented both within and outside of learning institutions”*. The authors notes that

“Open broadcasting of radio and video programs provides educational opportunities to those not participating in a school or nonformal learning program, and can also ‘demystify’ education for caregivers and community members, making learning content and objectives more transparent.”
(↑[Morris et al., 2021](#), p. 16)

The review includes outcomes about Interactive Voice and WhatsApp groups.
(↑[Morris et al., 2021](#), p. 42)

4.15.2. Technical and vocational education and training

Technical and vocational education and training is critical for prosperous and sustainable societies, but is also an under-researched area (↑[Haßler & Haseloff, 2022](#); ↑[Haßler et al., 2020a](#); ↑[McGrath et al., 2020](#); ↑[Musyimi, 2021](#); ↑[Namjoshi et al., 2021](#)).

4.15.3. Higher education

While EdTech is not essential in primary and secondary schools, it is critical in higher education. Many of the recent reviews and primary research discovered for this paper focused on higher education (↑[Bond et al., 2018](#); ↑[Bond et al., 2020](#); ↑[Bozkurt, 2022](#); ↑[Chen et al., 2022](#); ↑[Delnoij et al., 2020](#); ↑[Hamilton et al., 2021](#); ↑[He et al., 2021](#); ↑[Iwanaga et al., 2021](#); ↑[Kassim & Rampersad, 2022](#); ↑[Makoe & Olcott, 2021](#); ↑[Modise, 2021](#); ↑[Mphahlele et al., 2021](#); ↑[Mtebe et al., 2021](#); ↑[Mystakidis et al., 2022](#); ↑[Noetel et al., 2021](#); ↑[Owo & Udoka, 2021](#); ↑[Pinto & Leite, 2020](#); ↑[Tanyanyiwa & Madobi, 2021](#); ↑[Wilcha, 2020](#); ↑[Zhang-Kennedy & Chiasson, 2021](#); ↑[Zitzmann et al., 2020](#); ↑[van Gaalen et al., 2021](#)).

4.15.4. Environmental education

There were several reviews and noteworthy primary research on environmental education (↑[Ardoin et al., 2020](#); ↑[Cavus et al., 2021](#); ↑[Chinedu et al., 2018](#); ↑[Laksmi et al., 2021](#); ↑[Merritt et al., 2022](#); ↑[Rocksén et al., 2022](#)).

In STEM, rather than within environmental education, successful approaches to gamification are documented in two reviews ([↑Indriasari et al., 2020](#); [↑Kalogiannakis et al., 2021](#)).

4.15.5. Lifelong learning

Interesting recent finding regarding lifelong learning are documented in several publications ([↑Brown et al., 2021](#); [↑Kadhila & Nyambe, 2021](#); [↑Kalibwani et al., 2021](#); [↑Silva & Wijeratne, 2021](#)).

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