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Accelerated Learning and EdTech: A Rapid Evidence Review

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Rapid Evidence Reviews

This publication is one part of a series of Rapid Evidence Reviews that has been produced by EdTech Hub. The purpose of the Rapid Evidence Reviews is to provide education decision-makers with accessible, evidence-based summaries of good practice in specific areas of EdTech. They are focused on topics which are particularly relevant in the context of widespread global challenges to formal schooling as a result of Covid-19. All the Rapid Evidence Reviews are available at https://edtechhub.org/research/.

Contents

Abbreviations and acronyms

AEWG   Inter-Agency Accelerated Education Working Group

IAI   Interactive Audio Instruction

LMICs   Low- and middle-income countries

LICs   Low-income countries

HICs   High-income countries

RER   Rapid Evidence Review

Summary

This Rapid Evidence Review (RER) provides an overview of the existing literature on the use of accelerated learning in low- and middle-income countries (LMICs), with a focus on how EdTech might best be utilised for accelerated learning. It begins with a broad discussion of the components of accelerated learning, followed by a more focused discussion on how accelerated learning has been used to enhance learning outcomes for marginalised groups in LMICs. An exploration of how EdTech can be utilised for accelerated learning is then presented.

This RER has been produced in response to the novel 2019 coronavirus (COVID-19), and the resulting widespread shutdown of schools. It, therefore, highlights transferable insights that may be applicable to educational responses resulting from the challenges caused by COVID-19. Amongst those challenges are missed opportunities for education, with many children who were in school prior to the pandemic, falling behind their otherwise expected education level. Those who were previously out of school are falling behind even further. In light of this, measures that help improve the speed and effectiveness of learning are worth considering so that children might better catch-up on lost education. Previous research on accelerated learning can offer insight into the best methods for speeding-up, and potentially making more effective, the learning process. Notably, the RER aims neither to advocate nor discourage the use of accelerated learning in education in response to the COVID-19 pandemic. Instead, it provides an accessible summary of existing evidence on the topic so that educators, policy makers and donors might make informed decisions about the delivery of accelerated learning programmes, and especially through using EdTech.

The RER involved a systematic search for literature about accelerated learning across journals in education, social science and the humanities. Grey literature was also explored. The main studies referenced within this RER are written in the last 20 years and focus on accelerated learning programmes for children in LMICs. Also referenced is literature on how technology has been used to facilitate key pedagogical characteristics associated with accelerated learning, such as learner-centred pedagogy and students' social and emotional learning. There is, however, limited available literature that specifically explores technology-use and accelerated learning. Therefore the RER discusses EdTech in relation to individual accelerated learning principles instead. Details on the inclusion criteria for the RER, as well as the associated limitations, are explained in the methodology section. As will also be explained, the rapid nature of the review required a focused approach to literature discovery and a thematically guided process of analysis so that a

timely response to COVID-19 might be provided. The search strategy was not designed to be exhaustive.

The findings of the thematic analysis of included literature on accelerated learning are structured according to three themes:

1. Conceptualisations of accelerated Learning. This theme discusses the history of accelerated learning, as well as what accelerated learning involves in terms of pedagogy and other approaches.

2. Raising learning outcomes for marginalised groups through accelerated learning. This theme explores why and how accelerated learning programmes have been used to improve learning outcomes for children who have been marginalised in various ways.

3. Accelerated learning and EdTech. This theme discusses how accelerated learning might be facilitated through the use of educational technology in LMICs.

The key findings from this review are:

1. Accelerated learning programmes place great emphasis not only on speeding up learning, but on students' social and emotional learning, safety, interactive learning and flexible education. Across the literature, conceptualisations of accelerated learning differ. However, among the concepts that are commonly involved in such programmes is a focus on students being well supported by teachers, family and community. Also important are students having a psychologically and physically safe learning environment, there being flexibility to adapt to the needs of the learner, and having social interaction and student agency as part of the learning process.

2. Accelerated learning programmes can be an effective way to help children who have missed, or fallen behind on, education to catch up. When designing an accelerated learning programme, how much education children have missed, the children's age, the safety of the environment, the level of teacher professional development in accelerated learning, available EdTech, among other factors need to be considered. Different types of accelerated learning programmes are recommended based on those and other factors.

EdTech shows promise as an aid in the delivery of accelerated learning programmes for children, however, the area is under-researched in LMICs. Whilst there has been a great deal of research on accelerated learning and children broadly, and a lesser but still considerable amount on accelerated learning for children in LMICs specifically, there is quite limited evidence on how EdTech can support learning in LMICs. Studies discussing how EdTech

can support remedial learning suggest that it might play a positive role in accelerating learning through facilitating interactivity, learner-centred pedagogy, social and emotional development, giving access to education when children otherwise would not have and as a tool to enhance learners' support systems and assessment. However, due to technology not always being sustainable, feasible, and lacking support through teacher professional development and digital literacy, it is important to also consider non-technology-related education options. More research is needed.

1. Introduction

The COVID-19 pandemic has led to many students missing out on education. Physical distancing policies, to suppress the spread of the novel coronavirus, often advise that students and teachers cannot congregate in schools in the conventional manner. Uncertainty about how and when students might return to school, and how they might catch-up on missed learning when they do, is a challenge faced by many educational stakeholders. Accelerated learning programmes can, however, play an important role in tackling the educational challenges of COVID-19. In this RER, accelerated learning programmes refer to those programmes that aim to speed-up education, or otherwise help students who have 'fallen behind', whether by months or years, to reach the grade level that would be typical of their age. This RER provides a summary of how accelerated learning programmes have been used before the current pandemic, with a special focus on how technology might be used to facilitate learning as a response to COVID-19. It does this in order to offer insight and evidence that can assist in the development and implementation of effective programmes to help students catch up on learning both during the pandemic, and as the world exits it.

1.1. Purpose

Education has been globally disrupted as a result of the COVID-19 pandemic. Programmes designed to accelerate learning, or to help students to make up for time missed learning at school, are therefore of particular importance. Understanding the evidence on how accelerated learning programmes are applied in different contexts is crucial to informed decision-making in the COVID-19 response. This evidence review, alongside others, contributes to that emerging knowledge base and organises the most relevant literature into coherent themes for the consideration of key stakeholders in their own localised analysis of how to respond to the unique challenges of COVID-19.

1.2. Application

The insights presented in this RER are expected to be viewed as principles for the planning and implementation process of accelerated learning programmes. Many accelerated learning programmes work because the characteristics of, and approaches to, accelerated learning (that will be discussed in Section 3.1) are in place and help to reinforce each other. However, there may be more or less, some or no, need for the implementation of specific principles based on the unique context that an accelerated learning programme may be applied in. The expectation is that readers will draw on

their own expertise from their local context to apply the appropriate recommendations. The recommendations are not specific guidelines that can be applied universally.

1.3. Research questions

Three research questions guide the study:

1. What are the key characteristics of accelerated learning in LMICs?

2. To what extent have educational technologies been used to facilitate accelerated learning? How might these technologies be used?

3. What are the key lessons that can be drawn from the available literature to inform a response to the COVID-19 pandemic?

1.4. Structure of the RER

Following this introduction, the methodological approach is discussed, including details of the scoping review, the literature search, eligibility criteria and possible limitations of the methodology. Detailed findings are then presented under the three themes that emerged from a thematic analysis of identified literature. A brief section on emerging evidence of accelerated learning being used as a response to COVID-19-related learning losses follows. The report concludes by providing a synthesis of the findings from the literature.

2. Methodology

The methodological approach for this review is informed by the Cochrane Collaboration Rapid Reviews Methods Group interim guidance on producing rapid reviews (⬆Garritty, et al., 2020). This permits a rigorous and systematic approach, while defining the scope narrowly enough that it can be completed within a short span of time. This RER is modelled on a systematic, thematic review of primary studies, reviews, grey and other literature.[1]

The research process therefore comprised a systematic sequence of scoping, searching and screening. In the scoping phase, the research questions and eligibility criteria were defined and a brief scoping review conducted to help elicit relevant search terms for the search queries. Then a focused set of searches was run within the relevant academic databases. The search results were then screened according to the inclusion criteria.

2.1. Scoping Review

Scoping reviews involve a rigorous and systematic collection of evidence to inform a summarised and accessible overview; the key concepts and ideas that define a field are explored and discovered in an iterative process (⬆Daudt, et al., 2013; ⬆Levac, et al., 2010). Scoping reviews differ from a 'conventional' systematic review in that a greater variety of literature can be incorporated under its framework. Notably, the scoping review of this study did not aim to map out all the concepts, theoretical and otherwise, included in the scope of 'accelerated learning'. Instead, it had a more specific focus: to identify keywords and terms that had been used in studies that discuss accelerated learning, accelerated education, catch-up programmes or other formats of remedial and intensified education programmes. A special emphasis was also placed on the role technology played, or might play, in such programmes.

The scoping review process began by noting relevant keywords and terms that were already known to the author to search for additional literature. The process was iterative, with the terms found in one article leading to searches for other articles that then revealed different, or the same, terms. Using this method, a list of 21 search terms were compiled (Annex B). It is important here to draw attention to the point that when a search term brought up an article

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[1] According to ⬆Higgins, et al. (2019) : "A systematic review attempts to collate all the empirical evidence that fits pre-specified eligibility criteria in order to answer a specific research question. It uses explicit, systematic methods that are selected with a view to minimizing bias, thus providing more reliable findings from which conclusions can be drawn and decisions made (Antman et al 1992, Oxman and Guyatt 1993)."

with a relevant title, those articles were saved to be screened later alongside those that were found during the main literature search that is explained below.
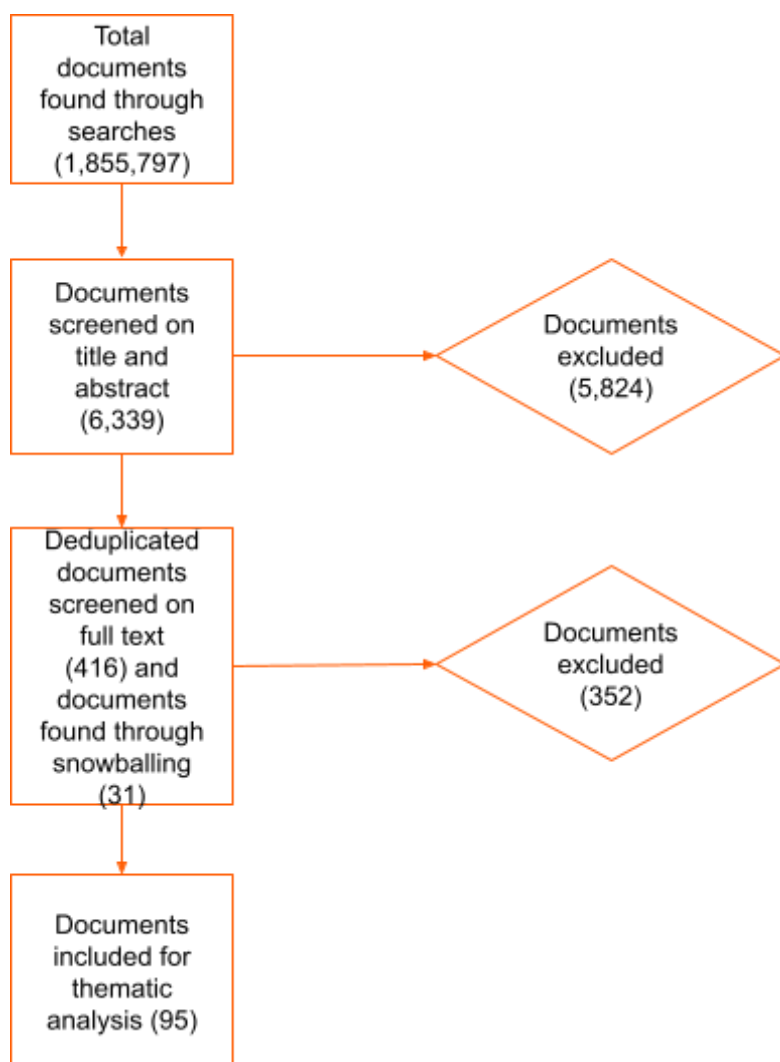
2.2. Literature Search

Databases, namely Google Scholar and Scopus, were searched for relevant articles. Figure 1 details the process used to arrive at the articles that were ultimately thematically analysed. It is important to highlight that unlike a more traditional systematic review process, which may screen all search results, the rapid review methodology used relied on a system of quotas. As such, only the top most relevant results (up to a maximum of the top 500 results), as ranked by each database used, were selected for the first round of title and abstract screening.

It is important to highlight as well that the results were not screened and ranked for 'quality' or limited to peer-reviewed/academic publications. Relying solely on peer-reviewed academic articles would have resulted in a narrower, less generalisable review. Crucially, this would also have excluded a larger number of voices from LMICs due to systemic factors excluding many academic researchers in LMICs from mainstream peer-reviewed journals.

2.3. Screening and eligibility criteria

The title and abstract screening, as well as all subsequent screening, were conducted according to the eligibility criteria laid out in Table 1. It should be emphasised that the screening criteria were not absolute. While the majority of sources included for thematic analysis met the eligibility criteria, a number of sources that were deemed especially informative but did not meet all the inclusion criteria were also included. These exceptions were made when an article met all except one of the eligibility criteria or represented key, theoretical pieces on accelerated learning.

Figure 1. Literature search and screening process.

Table 1. *Eligibility criteria for literature searches and screening.*

Criterion type	Inclusion criteria
Age	Under 18 years
Geography	LMICs
Literature type	All
Date	2000–2020
Topic	Studies exploring accelerated learning and intensified learning for disadvantaged, and average, learners. Notably, studies on accelerated learning for 'gifted' learners were excluded.

Finally, snowball sampling searches and expert referrals were used to discover relevant research for the thematic analysis. While the main thrust of the literature review involved a systematic approach, it is recognised that some influential sources might not be captured through those searches alone. It was therefore decided to search the reference lists of the most relevant papers found through the rapid evidence review for additional sources. Further, members of the EdTech Hub research team were asked whether they knew of any accelerated learning literature that might be included in the RER. These methods served to expand the literature (31 additional studies were considered) and also acted as an important quality control step, validating the rapid searching strategy.

Upon completion of the literature search and screening process, 95 papers were selected and thematically analysed. The groupings that emerged from that analysis were: Conceptualisations of accelerated learning, Raising learning outcomes for marginalised groups through accelerated learning and Accelerated Learning and Edtech. These three themes provide the structure and coherent organising principle for the discussion of the literature in the section titled 'Findings'.

2.4. Theme identification

The search and screening process identified 95 papers for analysis. A thematic analysis of these papers led to them being classified into three themes:

- Conceptualisations of Accelerated Learning
    - The origins of accelerated learning
    - Accelerated Learning in the context of LMICs
    - Pedagogical characteristics of, and approaches to, Accelerated Learning
- Raising learning outcomes for marginalised groups through accelerated learning
    - Over-aged and out-of-school children
    - Girls
- Accelerated Learning and EdTech
    - What is known and not known: Gaps in the research literature
    - EdTech for remedial education

2.5. Limitations

There are some limitations to this review stemming from the rapid timeframe and the nature of available evidence. These include:

- The search and inclusion strategy. An inherent limitation of the RER is that the search and inclusion strategy is not, by design, exhaustive and therefore it is possible that not all relevant literature has been located and included. Further, the searches were conducted in English, meaning that relevant literature on accelerated learning, in languages other than English – as are often spoken across many LMICs – largely remain unacknowledged.

- Limited Empirical Evidence. There is limited evidence on accelerated learning using technology in LMICs, and especially as it relates to children. Much of the research on accelerated learning and technology globally is based on higher education. Further, the research on accelerated learning in LMICs largely focuses on delivering primary education, rather than on secondary education, to children who have missed years of foundational schooling; these children are typically over-age, more cognitively advanced, and thus potentially able to learn more in less time. Therefore, the application of lessons learnt from accelerated learning programmes in LMICs, to the context of children at secondary level in LMICs, who have only missed out on a short amount of learning due to COVID-19, should be done cautiously. It might be reasonable to assume that since accelerated learning is quite commonly used in HICs for children's advanced secondary and pre-tertiary education, even when they are not over-age, that it might be possible to use accelerated learning in LMICs for the average secondary-aged child as well. This considered assumption underlies some suggestions made in this RER that accelerated learning might be a potential response to learning loss – in both primary and secondary education – brought on by the COVID-19 pandemic. However, notably for some children in HICs who partake in accelerated learning on advanced topics, they are believed to also have advanced cognitive abilities. More research is needed before there can be any definitive suggestion that accelerated learning can be effective for children's secondary and advanced education in LMICs, and especially as facilitated by EdTech.

- Limited comparative analysis. Another limitation is that the RER does not rely on comparative analysis to draw insights, but largely on narrative summaries. While an in-depth comparative analysis involving statistical and more comprehensive thematic analysis would certainly

be helpful in the future, this was not possible given the diversity of the literature encountered and the time constraints of this review.

- The generalisability of the findings to the pandemic context. Another limitation of this RER is that most of the evidence found does not directly relate to the current COVID-19 crisis. Nevertheless, many of the contextual factors remain consistent, and so valuable lessons might still be learnt.

- Our Positionality. While the EdTech Hub aims to facilitate and encourage global partnerships as they relate to the use of technology in education in LMICs, it is primarily led, funded and based, in HICs of the Global North. Effort is placed into trying to best represent, and centre, the needs and experiences of children from LMICs, and to critically and empathetically consider their diverse contexts. However, it is recognised that there are limitations in doing so as a 'foreign' organisation that has shortcomings in the linguistic, and other expertise, relevant for conducting research in various LMICs.

3. Findings

This section provides an analysis of the literature, grouped into the three main themes. The first section will explore the conceptualisation of accelerated learning, including common components of accelerated learning programmes. This will lead into a section that focuses on using accelerated learning for marginalised groups, including discussion of what should be considered when designing accelerated learning programmes. Out-of-school children and girls will be discussed. The final section builds on these discussions to suggest ways in which EdTech might facilitate accelerated learning for children in LMICs. Across all sections, the COVID-19 pandemic context will be considered, and critical considerations will be presented.

3.1. Conceptualisations of accelerated Learning

3.1.1. The origins of accelerated learning

There is no consistent conceptualisation of 'accelerated learning' (↑Fitzpatrick, 2020). However, broadly speaking, it refers to techniques that speed up the learning process, typically as the consequence of pedagogy and approaches that chiefly aim to encourage deeper and more intensive learning experiences. Notably, speeding up the learning process is not always the main aim of accelerated learning programmes, but sometimes instead the result of the implementation of more effective learning and teaching practices. These practices commonly, though not always, involve an emphasis on interactivity throughout the learning and teaching process, as well as personalised learning experiences, and less reliance on didactic methods that have been more traditionally used.

When one considers that most learning interventions aim to improve, or speed-up, the learning process, the question justifiably arises: What is the difference between an accelerated learning intervention, and any other intervention aimed at improving or speeding up learning? With the exception of accelerated learning interventions that are designed around condensing the curriculum, or increasing learning hours, differences are difficult to spot. Indeed, there is such a wide variety of programmes self-described as 'accelerated learning' that it can be argued that no real difference exists (↑Menendez, et al., 2016). However, one might make a distinction between programmes that use more accelerated learning pedagogical principles and approaches, and ones that use less. Accelerated learning programmes, that embrace all aspects of accelerated learning, aim for holistic child development and learning. They may not target one aspect of learning, such as in-classroom teaching, academic learning, or teacher professional development, but instead target multiple levels of education and child

development to effect change, with the expectation that learning can take place at a faster pace than typically occurs.

To understand the holistic focus of accelerated learning programmes, it helps to have an appreciation of how the model came into being. The concept of accelerated learning originated from neuroscience and psychological research, and has been developed through the work of many thinkers, including ↑Levin (1988), ↑Lozanov (1979), ↑Smith (2004), ↑Given (2002) and ↑Meier (2000). Through their studies, those, and other, researchers gained greater insights into how the brain processes and recalls information, the environment (and resources within) that encourage learning, and relatedly, pedagogy that stimulate deeper and more effective learning. Insights found on how learning can be sped-up range from focusing on learner-centred approaches (↑Menendez, et al., 2016), multiple intelligences (↑Gardner, 2011; ↑Menendez, et al., 2016), learning styles (↑Silver, et al., 2000; ↑Charlick & Prather, 2004) and learning in a safe, joyous environment that helps promote social and emotional learning (↑Charlick & Prather, 2004). It is these ideas that form the foundation of how accelerated learning is understood today: as a holistic pedagogical framework. Some of these ideas will be discussed later on in this section[2].

3.1.2. Accelerated Learning in the context of LMICs

Accelerated learning, as a concept, initially focused on children and adults in HICs in the Global North where it was, and is still being, used in the education

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[2] Notably, some of these traditional principles are contested, namely the ideas of learning styles and multiple intelligences– both of which are routinely conflated (↑Gardner, 2008; ↑Gardner, 2008). Learning styles have been critiqued on the basis of there not being enough rigorous evidence to support claims of the approach having a significant positive impact on learning outcomes, even when students have learning style preferences, as well as a lack of evidence backing learning styles theories themselves (↑Pashler, et al., 2008; ↑Nancekivell, et al., 2020; ↑Newton & Miah, 2017; ↑Gurung & Prieto, 2009). Though there have been critiques of 'general intelligence' being too narrow a concept, the theory of multiple intelligences has been critiqued on the basis of a lack of robust evidence to support the theory. It is also seen as conflating 'intelligence' and aptitude or talent. There are also high correlations between different types of the multiple intelligences and general intelligence, thus suggesting that multiple intelligences are not substantially different from the preceding theory of general intelligence (↑Visser, et al., 2006). Despite these ideas being contested, they still routinely feature in the accelerated learning literature. However, this review will not explore them further due to the already mentioned critiques.

of: children who are academically 'gifted' or believed to be cognitively advanced in certain areas (↑Steenbergen-Hu & Moon, 2011; ↑Kronborg & Plunkett, 2015; ↑Hemelt & Lenard, 2020; ↑Dare, et al., 2019; ↑Smedsrud, 2018), children who are behind where they would typically be expected to be (↑Mollette, et al., 2020) and adults in accelerated degree and career-related learning programmes (↑Cabral & Lambirth, 2018). However, the concept and associated pedagogy have since been widely adopted in LMICs and largely implemented through programmes developed and sustained by non-state education providers (↑Rose, 2009). The primary focus in LMICs is commonly on delivering primary and foundational education in literacy and numeracy, alongside life-skills, to children who are behind where they might be expected to be in their education (↑Menendez, et al., 2016; ↑Power, 2014). These children are typically over-age and/or have been out of school. Accelerated learning programmes in LMICs typically target children who are, and live among, the most disadvantaged communities within those countries, including those affected by conflict and poverty; and the programmes have had considerable success in improving access to education and raising learning outcomes (↑Power, 2014; ↑Deane, 2016; ↑Bilagher & Kaushik, 2020).

Since accelerated learning programmes in LMICs are often situated among those who are most disadvantaged, they commonly lack the resources (financial, time, etc) necessary to implement a 'full' or holistic accelerated learning programme, such as was originally conceptualised in resource-rich HICs (↑Boisvert, et al., 2017). Relatedly, they commonly focus on speeding-up learning by condensing the curriculum or removing non-core subject areas, while placing less emphasis on some of the psychological and pedagogical principles that birthed the idea of accelerated learning (↑Boisvert, et al., 2017). In recent years, this particular 'condensed' conceptualisation of accelerated learning has, instead, been referred to as 'accelerated education' by the Inter-Agency Accelerated Education Working Group (AEWG) (↑Boisvert, et al., 2017; ↑Shah, et al., 2017). The AEWG further considers accelerated education programmes as being for students who have missed years, as opposed to months of education; they note that a 'catch-up' programme may be appropriate if only a short period of education has been missed.

Unlike the AEWG's stricter differentiation between 'accelerated learning', 'accelerated education' and 'catch-up programmes', 'accelerated learning' will be used broadly in this review. Herein, accelerated learning therefore includes programmes that aim to speed-up education, or otherwise help students who have 'fallen behind', to reach the grade level that would be typical of their age–regardless of whether they are 'full' or 'condensed' accelerated programmes, for students who are behind on education by months or years, or considered 'remediation programmes'. Further, 'accelerated learning' in the context of this review will refer to accelerated learning with the purpose of

having students rejoin or continue on the traditional or established educational trajectories within a country, once they complete an accelerated learning programme or course, so that they might ultimately achieve national primary and secondary qualifications. Unless specifically stated, the literature being referenced therefore does not focus on accelerated learning programmes for 'gifted' students who are already at, or have surpassed, the typical education level achieved for their age and neither does it focus on accelerated learning as a route to alternative certification.

3.1.3. Pedagogical characteristics of, and approaches to, Accelerated Learning

The section details some of the pedagogical characteristics and approaches for accelerated learning that have been found across the literature, alongside considerations of those characteristics and approaches in light of the COVID-19 pandemic. 'Pedagogical characteristics' refer to teaching practices associated with accelerated learning, while 'Approaches' refer to actions taken to accelerate learning that are less strictly tied to any particular teaching methodology or framework. Notably, these characteristics and approaches are not those listed in any specific theory, but instead have been arrived at through thematically analysing the literature to discover what is common among accelerated learning programmes.

Pedagogical characteristics: cognitive development

The cognitive development of learners is a common focus of accelerated learning programmes (↑Jaimini, 2014; ↑Charlick & Prather, 2004), as well as of most other educational programmes. Cognitive skills are brain-based functions used to think, reason, learn and remember, make decisions and pay attention – all key to the learning process. However, beyond being a focus of accelerated learning programmes, cognitive development is also a foundational assumption of many accelerated learning programmes in LMICs. Older learners – those who typically tend to participate in accelerated learning programmes – are often more cognitively developed than younger learners, and therefore are better equipped to learn information and concepts that are below their expected grade level, at an accelerated or intensive pace when compared with students who are at the age that is expected of their grade level (↑Bilagher & Kaushik, 2020; ↑Boisvert, et al., 2017; ↑Wali & Mustapha, 2019). The fact that older students are more cognitively developed, and at a different developmental stage, also influences how they should best be grouped for

accelerated learning, as it may be psychologically detrimental for older learners to group them with younger ones (↑Boisvert, et al., 2017).[3]

However, the assumption of being at a further developmental stage, than might be typical of the grade level one is studying, may not as strongly underlie the delivery of accelerated learning programmes as a response to COVID-19 school closures. Unless pandemic-related disruptions continue well into the future, children returning to schooling after COVID-19-related disruptions will likely be at the age and developmental stage that are typical for their grade level – this is apart from those children who were already over-age prior to the pandemic. Therefore, depending on the length of the COVID-19-related disruption, students may not, or may, be a great deal more cognitively developed than they were prior to schooling disruption. Depending on the age and cognitive developmental stage of the students being targeted, the intensity typically associated with accelerated learning programmes may need to be reduced, or adjusted accordingly.

Social and emotional learning and safety

Another characteristic that is commonly present in Accelerated Learning programmes is that of the promotion of social and emotional learning and wellbeing, and a safe (in terms of health and the broader environment), low-stress learning environment (↑Acevedo & Hernandez-Wolfe, 2014; ↑Charlick & Prather, 2004; ↑Randall, et al., 2020; ↑Nicholson, 2018). Social and Emotional Learning refers to "the processes through which children and adults acquire and effectively apply the knowledge, attitudes, and skills necessary to understand and manage emotions, set and achieve positive goals, feel and show empathy for others, establish and maintain positive relationships, and make responsible decisions" (↑Collaborative for Academic, Social, and Emotional Learning, 2012, p.4). However, there is less monitoring and evaluation of social and emotional outcomes, than of cognitive and academic outcomes, in accelerated learning programmes in LMICs (↑Shah & Choo, 2020).

Both social and emotional learning and safety are important for children in and of themselves. However they also relate to enhanced academic outcomes and the development of cognitive skills (↑Zins, et al., 2007; ↑Berkowitz, et al., 2017). Whilst social and emotional learning and safety are important in educational programmes generally (↑Gray, et al., 2011), those characteristics may be especially important in accelerated learning programmes where they

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[3] The safeguarding of younger learners is also a concern when grouping them with older learners in an accelerated learning programme. This is especially pertinent when grouping younger girls with older boys (↑Boisvert, et al., 2017).

can help students cope with the added course intensity (↑Ramachandran, 2007).

There is further need to consider social and emotional learning and safety when working with vulnerable or marginalised students. Children who have been deprived of opportunities for education sometimes develop increased motivation, enthusiasm and other social and emotional competencies required for pursuing academic learning. Not having had educational opportunities sometimes fosters great appreciation and motivation to take advantage of the opportunities when they arise (↑Ramachandran, 2007). However, out-of-school and over-age children, those with disabilities and girls, for example, often also have additional challenges and traumas, placed on them by their environments, that sometimes result in reduced physical safety, poorer health, confidence, motivation and other key social and emotional competencies (↑Ramachandran, 2007; ↑Acevedo & Hernandez-Wolfe, 2014; ↑Nicholson, 2018).

Discussing accelerating the education of Syrian refugees in Jordan, for example, ↑Shah (2017, p. 6) notes that:

A strong component of NRC's [Norwegian Refugee Council] programming has been to support children not just academically, but socially and emotionally as well through the inclusion of a strong life skills and PSS [psychological support] component to its programme, as well as by mainstreaming a strong protection component across all its activities. The evaluation found that this focus had demonstrable impacts on the ability of its beneficiaries to regulate their emotions, and improve connections to peers and other adults, as well as their behaviour. More broadly it was also found to have important impacts on their overall state of well-being and sense of safety and security within the camp setting.

An enthusiastic attitude does not offset marginalised children's need for social and emotional learning, appropriate health facilities, safety and other support.

The COVID-19 pandemic has increased the numbers of students dealing with trauma and in a state of educational and socioemotional vulnerability, and has increased the stresses on students who were already marginalised (↑Clarke, et al., 2020; ↑Cambridge University Press, et al., 2020). The pandemic may not only lead to children's learning loss (↑Azevedo, et al., 2020), but has already involved a loss of opportunities for children to develop social and emotional relationships with friends (↑Clarke, et al., 2020). There is consequently even greater need for social and emotional learning, and associated support, as well as its monitoring and evaluation, if students are to catch-up on missed learning, through an accelerated learning programme or otherwise.

Learner-centred and activity-based pedagogy

Accelerated learning programmes are also commonly grounded in the use of learner-centred pedagogy and practice, and interactivity (↑Akyeampong, et al., 2016;↑Randall, et al., 2020; ↑Menendez, et al., 2016), which is itself grounded in social constructivist theory (↑Vygotsky, 1980;↑Dewey, 1986). Conceptualisations of learner-centred pedagogy vary across the literature, with some conceptualisations of it being narrower than others, or even somewhat contradictory (↑Bremner, 2020). The conceptualisation of learner-centred pedagogy is not fixed. It exists on a continuum: it can involve some learner-centred practices, and some direct-instructional/teacher-centred practices, and still be considered as 'learner-centred'. Relatedly, the practices incorporated within learner-centred pedagogical frameworks also vary. However, a learner-centred approach can roughly be thought of as referring to a "pedagogical approach which gives learners, and demands from them, a relatively high level of active control over the content and process of learning. What is learnt, and how, are therefore shaped by learners' needs, capacities and interests" (↑Schweisfurth, 2013, p. 20). Practices associated with learner-centred approaches therefore tend to facilitate the child's agency and motivation to learn. This sometimes involves a degree of learning personalisation, as might be afforded by smaller class sizes, as well as interactivity – both in terms of student to student interaction and teacher to student interaction, through methods such as dialogic instruction, group-work and play (↑Schweisfurth, 2015; ↑Lisanza, 2014; ↑Wang, 2018). There is wide-ranging evidence supporting the view that learner-centred approaches, and related practices, can result in greater learning outcomes broadly (↑Kaput, 2018) and in accelerated learning programmes specifically (↑Banerji & Chavan, 2016; ↑Rauchwerk, 2017). Learner-centred approaches have also been widely championed by leading international educational donors and non-governmental organisations, such as UNICEF and the UNHCR (↑Schweisfurth, 2019; ↑UNHCR, 2011).

This championing of learner-centred approaches by donors has been influential in the adoption of the associated approaches for education in LMICs (↑Chisholm & Leyendecker, 2008; ↑Tabulawa, 2003). However, despite concerted support for such approaches in LMICs, they have achieved fewer success than initially predicted (↑Schweisfurth, 2015). Limited resources for learner-centred teacher professional development and to support the added time and effort that such approaches often require, alongside frequently large class sizes, often make learner-centred approaches difficult, or even inappropriate to enact (↑Schweisfurth, 2015; ↑Schweisfurth, 2015). Further critique has been levied at the approach for insufficiently considering its cultural and ideological applicability to LMICs across the Global South, especially given that much of the research in support of the pedagogy is

based on HICs in the Global North (↑Tabulawa, 2003). Even in those HICs in the Global North, learner-centred approaches, while popular, do not have universal support (↑Clifford, 2015).

Across the literature, there is both support for learner-centred approaches and an appreciation of their shortcomings. There is also an understanding that advocating learner-centred pedagogy need not mean rejecting all direct-instructional pedagogy. Consequently, the overarching message that might be taken from the literature is that learner-centred approaches and practices should be considered when designing an accelerated learning programme, but only insofar as it takes local contexts into account and serves the specific educational needs of a community. Given the specific challenges of COVID-19 – such as remote learning using EdTech, and physical distancing preventing certain levels of interactivity within classrooms – there may be added need for using flexible pedagogical approaches to accelerate learning. Indeed, ↑McAleavy & Gorgen (2020, p. 3) explain that,

"It is a false dichotomy to propose that undesirable 'teacher-centred' rote learning or desirable 'student-directed […] the effective remote teacher is a subject matter expert skilled in different aspects of 'direct instruction', including exposition and explanation. At the same time, students are highly engaged in their own learning."

There should be consultation with educators and students in a context, noting where learner-centred inquiry versus, or alongside, direct instruction might be best used for any accelerated learning programme that is developed. Further, it should be kept in mind that a number of LMIC accelerated learning programmes have small class sizes, and are implemented on a small scale by non-state education providers. There is therefore some uncertainty surrounding how the learner-centred approaches, and interactivity of accelerated learning programmes, might be best translated to larger class sizes and scaled up provision by government – as might be the case if accelerated learning is used as a response to COVID-19-related learning losses.

Community-Integrated support

The final pedagogical characteristic of accelerated learning programmes is that of the need for learners to have well-developed support systems (↑Abreh & Wilmot, 2018). Specifically here, these are support systems in the school (teachers and administration), home (parents and caregivers) and community (↑Longden, 2013; ↑Hartwell, 2016; ↑Rauchwerk, 2017; ↑Fitzpatrick, 2020; ↑Carter, et al., 2020). The intensive nature of accelerated learning, alongside the common need for flexibility if such programmes are to be successful, often necessitates appropriate teacher professional development as well as holistic social support in the community and otherwise (↑Hartwell, 2016; ↑Menendez, et al., 2016). Indeed, in some cases, it is the local community that facilitates the

establishment and provision of accelerated learning programmes (e.g. Complementary Basic Education: ↑Akyeampong, et al., 2018 and School for Life: ↑Akyeampong, et al., 2018 – both in Ghana). Parents, caregivers, teachers and community facilitators should ideally be empowered to assist learners in their accelerated learning, and should build relationships with each other, for the benefit of the student. In the absence of such support, children may be unable to engage fully with an accelerated learning programme because of disruptions caused by having too many chores, insufficient time to complete homework, and a general lack of encouragement from, and formal education background among, the adults in their lives (↑Ramachandran, 2007).

The need for well-developed support systems is especially important during the COVID-19 pandemic, as well as will be in its aftermath. Beyond the already discussed need for children to have socioemotional support to deal with the traumas of COVID-19 – support which parents, caregivers and teachers themselves also need (↑World Health Organisation, 2020) – are children's need for support in learning at home. The pandemic has resulted in greater instances of education being delivered remotely as well as increased use of blended learning (↑World Bank, 2020; ↑McAleavy & Gorgen, 2020). Both remote, and blended learning, though more successful if student's have some degree of autonomy over their learning process, may be even more successful if parents, caregivers, teachers and community facilitators are able to be more supportive in the learning process. This might necessitate investment in parents and caregivers gaining/ developing the knowledge and skills for homeschooling to a greater degree than in recent history. It may also rely on governments and non-state education stakeholders facilitating the agency of communities to further develop and support accelerated learning programmes.

3.1.4. Approaches to accelerated Learning

As mentioned above, there are also approaches used in accelerated learning programmes that are relatively independent of pedagogy. These are presented below.

Assessment, flexibility and condensed curriculum

Prior to admittance to an accelerated learning programme, as well as during it, establishing a child's educational level and needs, through some form of diagnostic assessment, is important (↑Baxter & Bethke, 2009; ↑Banerji & Chavan, 2016; ↑Boisvert, et al., 2017; ↑Schwartz, 2012). Needs assessments are essential in ensuring that children who are known to have missed out on schooling, or who have fallen behind on learning, are not placed on courses

without the foundational knowledge and skills required, or alternatively, are not placed on courses that repeat what they have already sufficiently learnt.

Whilst diagnostic assessment is a crucial component of many existing accelerated learning programmes in LMICs, insofar as placing children in appropriate learning groupings, its purpose may be different for accelerated learning programmes developed in response to disruptions caused by the COVID-19 pandemic. Students who have missed out on months of schooling, solely due to COVID-19, will have missed out on roughly the same period of learning, and so may all be able to re-enter schooling in the same grouping they were previously in (↑Kaffenberger, 2020). However, there will most certainly be some individual and group differences in learning needs. These may be related to the amount of learning that children were able to undertake while away from regular school (a factor heavily influenced by the socioeconomic status of their family and parents/caregivers ability to support learning) (↑Vignoles, et al., 2020), individual differences in self-directed learning and the amount of learning they might have forgotten due to a lack of formal practice in school (↑Kaffenberger, 2020). Consequently, diagnostic learning needs assessment is still important in directing teachers, parents, caregivers and policy makers concerning what level of additional support and remediation a child might need.

Beyond conducting needs assessments of learners if a successful accelerated learning programme is to be run, is the need for flexibility, across multiple domains of a programme. This topic is commonly discussed in the accelerated learning literature (↑Akyeampong, et al., 2016;↑Shah, et al., 2017; ↑Menendez, et al., 2016; ↑Börkan, et al., 2015) and relates to flexibility in, for example:

1) adherence to curriculum objectives and policy guidelines – such as a willingness to alter when a stated objective should be achieved, or what is included within it (↑Baxter & Bethke, 2009; ↑Hussaini, 2011);

2) the language of instruction – in many countries that were previously colonised, the official language is not the commonly spoken local language or dialect. However, there is evidence, from Complementary Education programmes (e.g. School for Life ; ↑Arkorful, 2010), to suggest that many children do not fully grasp concepts taught because it is in a language they are not familiar with. Teaching using a familiar language, or teaching more with a familiar language, can help accelerate learning (↑Carter, et al., 2020; ↑Abreh & Wilmot, 2018; ↑Akyeampong, et al., 2018; ↑Casely-Hayford & Hartwell, 2010; ↑Zsiga, et al., 2014);

3) the age of children admitted to any specific level of the programme and expectations of children's prior attainment (↑Boisvert, et al., 2017);

4) schooling hours and schedules – including increasing schooling hours, using shift systems, or otherwise adjusting temporal teaching patterns as necessary to reach all students (↑Shah, et al., 2017; ↑Banerjee, et al., 2016).

As with the accelerated learning programmes discussed in the pre-COVID-19 literature, accelerated learning programmes that respond to learning disruptions caused by COVID-19 may also need to be flexible in:

1) schooling hours – physical distancing requirements may necessitate temporal distancing, such as through shift systems or part-time learning, so that all students can be safely accommodated in schools (↑Panovska-Griffiths, et al., 2020). Increased schooling hours may also be necessary to accommodate more intense learning, especially where there are limited provisions for the teacher professional development that might be necessary for improving the effectiveness of teaching;

2) blending learning – varying mixtures of in-person and distance (through EdTech and print media) learning may be required to ensure that students can learn, whether they can be in school or not (↑McAleavy & Gorgen, 2020).

Finally, apart from the need for flexibility, or perhaps included within the framework of 'flexibility', is the consideration of a condensed curriculum as might be necessary when other options for speeding up learning are not feasible (↑Longden, 2013; ↑Menendez, et al., 2016; ↑Nicholson, 2018). Some accelerated learning programmes omit subjects deemed as unessential so that time and resources might be freed up to spend on subjects considered as core (typically literacy, numeracy and on occasion, science) (↑Longden, 2013). Curricula can also be less drastically condensed by removing repetitive aspects within subject lessons and ensuring that there is overlap in what is learnt across different subject areas, such that lessons in one subject class can inform learning in another (↑Boisvert, et al., 2017). These considerations are especially relevant when students or teachers cannot devote more time to catch-up on learning, or there are insufficient human and other resources to support the improvement of pedagogy to facilitate more effective and efficient learning (↑Boisvert, et al., 2017). Though omitting subject areas might be applied to COVID-19 related learning loss, especially for students who had already lost significant amounts of learning, and have been further disadvantaged due to COVID-19, it may be less necessary for those who have only missed out on a few months of learning. Instead, for students with limited learning loss, reducing repetition, ensuring lesson overlap, or targeting accelerated learning techniques to the subject areas they find most problematic, might be sufficient.

Formats of accelerated learning classes

This final section on approaches to accelerated learning considers the format of learning delivery. The format can involve:

1) A complementary education programme – this format is commonly used for addressing the needs of students who are outside the formal education system (↑Baxter & Bethke, 2009; ↑Wang, 2018; ↑Schwartz, 2012; ↑Casely-Hayford & Hartwell, 2010). Examples of programmes using this format are Second Chance (also referred to as 'Speed Schools') by the Luminos Fund (↑Akyeampong, et al., 2018) and Complementary Basic Education in Ghana (↑Akyeampong, et al., 2018). Programmes following this format provide education outside of the typical primary and secondary school systems. They are more likely to be successful if they have links to the typical primary and secondary school systems and aim to have students rejoin the conventional education system or achieve nationally accredited qualifications (↑Fitzpatrick, 2020). This format may be among the least applicable to students who have only missed out on education as a result of COVID-19 disruptions, as those students may be able to reintegrate into the conventional education system with relative ease;

2) more intense lessons – as the name suggests, this format helps accelerate learning by making lessons more intense, teaching students more and more complex concepts, or giving students special extra attention within the same time frame (↑Banerjee, et al., 2016; ↑Menendez, et al., 2016). This format is among those that are most reliant on the pedagogical characteristics described previously, as it may require additional pedagogical support and effective teaching;

3) extended learning hours within the normal school day – this format focuses on helping students to catch up on missed learning opportunities by extending teaching and learning time;

4) remedial lessons after-school, on weekends or during school holiday periods – this format offers additional lessons, targeted at addressing the specific needs of learners in all, or specific, subject areas (↑Banerjee, et al., 2016). An example of a programme using this format is Pratham's Teaching at the Right Level[4];

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[4] Notably, Teaching at the Right Level does not aim to accelerate learning, and so technically might not be considered an accelerated learning programme by some definitions. It instead aims to teach students from their point of need. Nevertheless, their approaches might be a useful starting point in the

5) dedicated hours within a regular school day where students are regrouped by education needs – this format relies on setting aside specific time during the school day, where students are regrouped according to their learning needs, as opposed to their grade level. Working with their teachers, focus is given to building students' competencies in their areas of greatest need. An example of a programme using this format is Pratham's Teaching at the Right Level (↑Teaching at the right Level, 2020).

3.2. Raising learning outcomes for marginalised groups through accelerated learning

The previous section explored approaches to and the pedagogical characteristics of accelerated learning programmes, with added attention given to their applicability to COVID-19 related learning disruption. This section, however, presents deep dives into two common recipients of accelerated learning programmes: over-aged and out-of-school children, and girls. These 'dives' will be instructive in better appreciating the challenges associated with trying to implement an accelerated learning programme. It will also highlight questions that should be considered when attempting to do so. It showcases what the literature has to say about each group specifically and presents brief illustrative examples of accelerated learning programmes, namely of Speed Schools in Ethiopia and Liberia (↑Centre for International Education, 2020) and Valorisation de la Scholarisation de la Fille (VAS-Y FIlle!) in the Democratic Republic of the Congo (↑Development Tracker, 2019). Notably, each group discussed here is not distinct, but intersectional. Therefore, for example, the literature referring to 'girls' cannot be abstracted from 'out-of-school' children', but instead, lessons on 'girls' should be read cognisant that some of them may be out-of-school.

3.2.1. Over-aged and out-of-school children

Accelerated learning for out-of-school and over-aged children is a key focus of the literature from LMICs (↑Rauchwerk, 2017; ↑Hartwell, 2016; ↑Bilagher & Kaushik, 2020; ↑DeStefano, et al., 2007). Globally, it is estimated that 258 million children and youth are out-of-school (↑UNESCO Institute for Statistics, 2019). Children who are deemed as over-aged have fallen behind in school by two or more years, while out-of-school children are those who are not currently enrolled in formal education. There are many reasons why children may be out of school, or might be above that age that is typical, or expected, for their grade level. Amongst these reasons are war and conflict in their

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development of accelerated learning programmes as a response to COVID-19 related learning loss.

region/country (↑Menendez, et al., 2016; ↑Nicolai, 2003), working to help support their family (↑Rauchwerk, 2017; ↑Ramachandran, 2007), the cost of schooling (↑Ramachandran, 2007; ↑Randall, et al., 2020; ↑Asante, 2011), as refugees, the absence or inefficiency of policy allowing them to take full advantage of a host country's school systems (↑Deane, 2016), being too old to reenter traditional education systems, but too young to enter adult education and natural and other disasters and emergencies (↑Boisvert, et al., 2017; ↑Babadogan, et al., 2006). Helping out-of-school children to enter or return to education involves targeting programmes to different solutions depending on the reasons for them being out of school, be that financial assistance, improving safety and access to health services or other reasons.

However, even if concerns are addressed allowing out-of-school children to enter the education system (formal or otherwise), there remain challenges to be addressed within schools. Many children entering, and within, schooling are at different educational levels (↑Banerjee, et al., 2016), at different ages and there are protection and safeguarding concerns that may arise if older and younger students are put into the same classroom (↑Boisvert, et al., 2017). Further, enrolment does not necessarily lead to learning; many children who have consistently been enrolled in schools in many LICs have not acquired basic math and language skills (↑Abreh & Wilmot, 2018; ↑Banerjee, et al., 2016), much less students who have been out-of-school. All of these concerns have been further compounded by the COVID-19 pandemic. Children who were already out-of-school and over-age may be further marginalised in the current climate, with the global financial challenges brought on by the pandemic expected to result in an approximate increase of the global out-of-school population by 2% (↑Azevedo, et al., 2020). Further, an estimation of learning loss over the 3-months between students transitioning from a Complementary Basic Education programme in Ghana to government schools, estimates losses as between "just over half to more than 100% of the gains attained during the prior year" (↑Sabates, et al., 2020, p. 26) – this illustrates the urgency of resuming learning in and beyond the COVID-19 context.

Accelerated learning programmes offer a route to helping students quickly catch up on missed learning. Participation in accelerated learning programmes has been shown to result in raised learning outcomes, on average, and relatively higher continuous school enrollment, than participation in conventional education (e.g. Speed Schools: (↑Akyeampong, et al., 2018; ↑Zerihun, et al., 2019 and Complementary Basic Education: ↑Akyeampong, et al., 2018). Children in accelerated learning programmes even at times surpass their peers once rejoining conventional schooling (ibid). However, the variety of reasons why children are out of school, alongside their age and prior educational level, may make it difficult to have a one-size-fits-all

approach to an accelerated learning programme. In deciding the best route to take in developing a programme for a specific type of out-of-school or over-age child, the literature suggests that a few questions be asked, some of which build on what has already been discussed in Section 3.1. Summarised, these questions, and related considerations are:

1. How much education has a child missed?

    a. Limited learning loss: If upon evaluation, students are deemed to not be significantly behind on their schooling, any of the formats discussed in Section 3.1 may be appropriate.

    b. Significant learning loss: If students are evaluated as being significantly behind on their learning, and have missed a great amount of time in school, such as over one year, they are likely to have more significant learning loss. A different approach may therefore be needed. Whilst consideration 'a' above still holds if the lost schooling is limited, if students have been out of school for years, then having them immediately return to regular schooling may not be appropriate. Instead, children might benefit most from a complementary accelerated learning programme with a reduced or condensed curriculum. The aim should be to help them to either return to the formal education system once they've progressed to the expected grade level, or to take the examinations that children in formal school might be working toward.

2. What is the child's educational level and their educational needs?

    a. Appropriate diagnostic assessments should be considered.

3. What is the child's age?

    a. As discussed in Section 3.1, safeguarding concerns should be considered for younger children and the more advanced cognitive development of older students should be factored in when grouping them. Further, the potentially damaging psychological impact of being grouped with other children of different ages should be considered for students in all age groups.

4. What are the resources available for education?

    a. Resources for Teacher Professional Development and Time: If minimal resources are available to support teacher professional development in accelerated learning principles then the accelerated learning programme may have to rely on speeding up

learning through the approaches discussed in Section 3.1. Choosing an appropriate format will, to some extent, depend on the time teachers are able to commit to a programme, as well as the number of teachers that are available to teach.

b. Sustainability, Monitoring and Evaluation: Many accelerated learning programmes fail because of a lack of sustainable funding, monitoring and evaluation of the programme. It is crucial that realistic plans are made concerning the scale of a programme; how long an accelerated learning programme needs to be run and how it will be funded. Monitoring and evaluation of the programme and of students' transition out of the programme, need to be considered as well to ensure that all children receive quality education (↑Fitzpatrick, 2020).

5. Is there a national policy for the integration of complementary accelerated learning programmes and conventional schooling?

a. Complementary accelerated learning programmes are more likely to be successful if they lead to reintegration into national primary and secondary schools, or otherwise lead to nationally recognised qualifications (↑Fitzpatrick, 2020; ↑Boisvert, et al., 2017).

Box 1. *Example of an accelerated learning programme targeting out-of-school children.*

Second Chance (Speed Schools)

Organisation: Luminos Fund
Countries it operates in: Ethiopia and Liberia
Target Audience: Over-age and out-of-School children
Learning Focus: Basic skills (literacy & numeracy)
Pedagogical characteristics used: Learner-centred & activity-based, Play, System-wide support, Social and emotional wellbeing
Format: Complementary education programme using individual attention to rejoin mainstream education
Other Approaches: Continuous needs assessment and Condensed curriculum
Status: Ongoing
Additional Reading: (↑Akyeampong, et al., 2018)

3.2.2. Girls

Although the challenges and solutions discussed above apply to girls, as well as to boys, there are unique considerations that the literature suggests should be taken into account when implementing accelerated learning for girls who have missed out on education. This section focuses on those considerations.

Girls are a routinely marginalised subsection of the student population in many LMICs, such that their academic outcomes and learning progression are routinely lower than boys' (↑Indabawa, 2006; ↑Randall, et al., 2020; ↑Ramachandran, 2007; ↑Carter, et al., 2020). Pressure into early marriages, the additional burdens of household chores and childcare responsibilities, a lack of female teachers as role-models, insufficient facilities for female sanitation at schools, pervasive gender stereotypes held by parents, teachers and girls themselves, as well as succeeding in certain subject areas commonly considered as 'masculine' are all gendered concerns (↑Nicholson, 2018; ↑Evans, et al., 2020; ↑Ramachandran, 2007; ↑Carter, et al., 2020). The picture across LMICs, is not, however, one that can be wholly generalised (↑Evans, et al., 2020). Whilst in recent years, girls tend to slightly outperform and have greater access to education in a number of Caribbean and Latin American countries, girls in South Asia, the Middle East and sub-Saharan Africa are still well behind boys in educational access and outcomes (↑Evans, et al., 2020). Across all regions though, and in HICs as well, pervasive gender stereotypes and social norms of girls being caretakers, homemakers, passive, diffident and less analytical than boys means that girls are less encouraged toward success in subject areas such as math and sciences (↑Miller, et al., 2018). Further, and especially in contexts of war, conflict and with high incidence of crime and sexual violence, girls are less likely than boys to be allowed to travel to school because of increased fears for their safety (↑Randall, et al., 2020).

Given these broad realities, that centre largely around gendered social attitudes to girls, their additional responsibilities and concerns for their safety, accelerated learning programmes that are designed for girls have had special foci on developing girls' socioemotional well-being, flexible schooling arrangements, life- and vocational- skills development, hiring more female teachers, changing the social attitudes of the support systems around them and developing learning environments and commutes within which they can feel secure (↑Randall, et al., 2020; ↑Fitzpatrick, 2020; ↑Shah & Choo, 2020; ↑Idara-E-Taleem-O-Aagahi, 2018; ↑Marcus, 2019). These measures are in addition to what has been discussed in the previous subsection. Notably, while accelerated learning programmes can be a route forward for girls who have missed out on education, there should be thorough consideration of the social context within which such a programme is implemented. There is the risk that some parents might choose to keep girls out of school for longer periods because of the knowledge that accelerated learning programmes exist that might help them to catch up later (↑Ramachandran, 2007). Accelerated learning programmes, of the form that typically exists for children in LMICs, should not be seen as a substitute for quality traditional education routes, but instead as a last resort (ibid.).

Box 2. *Example of an accelerated learning programme targeting girls.*

Valorisation de la Scolarisation de la Fille (VAS-Y FIlle!)

Organisation: Girls' Education Challenge, Trust Merchant Bank, International Rescue Committee, Save the Children, Catholic Relief Services
Countries it operates in: Democratic Republic of the Congo (primarily in rural areas)
Target Audience: Over-age and out-of-School girls
Learning Focus: Basic skills (literacy & numeracy)
Pedagogical characteristics used: Support-systems, Safety
Format: After-school tutoring, More intense lessons
Other Approaches: Mentoring by past pupils
Status: Completed
Additional Reading: (↑Randall, et al., 2020)

3.3. Accelerated Learning and EdTech

3.3.1. What is known and not known: gaps in the research literature

Whilst a fair amount of literature explores accelerated learning initiatives in a general sense, there is much less literature focusing on the role of technology in accelerated learning in LMICs. This is especially true when 'remedial education' more broadly is removed from the expected definitional remit of 'accelerated learning'. Further, while there is wide-ranging literature on EdTech and accelerated learning for higher education, and adult learning (↑Lowenthal, 2016), the field is much sparser when children are the subject, and especially children from LMICs.

This is not surprising given that EdTech can be expensive to procure, maintain, many students do not have the technological literacy to best capitalise on technology as a learning tool, and EdTech often needs additional teacher professional development and support to be effectively used (↑Hennessy & London, 2013). Further, many accelerated learning programmes in LMICs operate in communities that are socioeconomically disadvantaged and the projects have limited available funds, and there are often more sustainable learning interventions that a programme's limited funds can be spent on instead of EdTech. Indeed, ↑Sabates,and colleagues (2020, p. 19), in a recent evaluation that explored data on the transition period from complementary basic education, to formal schooling to help estimate learning loss due to COVID-19 school closures, found that "... with respect to having access to a television, radio or mobile phone at home, we did not find statistical differences in relative learning loss for children who had access to at least one

of these assets at home and those who did not." Instead, "not being motivated to put forth effort to study lessons learned while in school, being unable to ask for help from primary caregivers or adults in the household, as well as a lack of books and opportunities to engage in learning activity at home led to the largest relative losses for students" (↑ibid., p. 26) Sometimes, EdTech is not the best answer (↑Sancho-Gil, et al., 2019; ↑Selwyn, et al., 2015; ↑Piper, et al., 2016). Only two studies were found that explored relationships between EdTech usage and 'accelerated learning' among children in LMICs (Indonesia and Turkey). Both studies had mixed results and are discussed below.

The Indonesian study used mixed methods and centred around an EdTech (Edmodo) intervention for mathematics learning in secondary education (↑Yaniawati, et al., 2017). They found that students who learnt using accelerated learning principles, alongside the use of EdTech, were able to better connect mathematical concepts than students who learnt using conventional methods and without EdTech. However, they found no difference in self-regulated learning between students in the accelerated learning and conventional learning groups. Importantly, the accelerated learning principles used in the intervention did not all involve EdTech. EdTech was seen as able to facilitate accelerated learning because of its capability for interactivity and engagement. It was used to help students acquire information according to their own needs, therefore enabling personalised learning, as well as to give them agency in the learning process through searching for the meaning and implications of the problems they encountered. Accelerated learning principles related to student motivation, developing their self-confidence, and sharing and reflecting on what they learnt, were activities engaged in, in the classroom, that did not directly involve EdTech.

The study also did not present a disaggregation of the effects of the EdTech components of the accelerated learning intervention specifically. Instead, it presented effects of the accelerated learning intervention as a whole. It is therefore difficult to confidently say that EdTech for accelerated learning was a significant factor in students' increased mathematical connection capabilities, as opposed to accelerated learning principles more broadly. Further, with little description of what 'conventional learning' involves in the study, it is difficult to know how the accelerated learning intervention substantially differed from conventional learning. Still though, the study presents some initial insight into the potential of EdTech for facilitating accelerated learning, though not roundly confirming its effectiveness.

The second study, based in Turkey (↑Akbıyık & Şimsek, 2009), compared whether accelerated learning in a computer environment had a different impact on student achievement than accelerated learning in a classroom environment. The study was experimental and focused on teaching science to

primary school children. The aspects of accelerated learning explored in the study revolved around ensuring that students felt calm and secure in their learning environment, that they believed the authority of the teacher, as well as were able to engage in interactive, positive and fun activities. There was extensive use of classical and baroque music, and teaching using rhythm and intonation, to help students to relax, as well as to help them consciously and unconsciously process information. Results showed that there was no difference in students' achievement, whether they were taught using accelerated learning in a computer environment, or in a classroom environment. However, students' achievement was higher in accelerated learning environments than in expository learning environments[5]. The study therefore showed that while EdTech might be helpful for accelerated learning, it was not additionally helpful. However, there should be some caution in generalising the results to many other LMICs in the Global South as the theoretical model of accelerated learning used was notably Eurocentric in nature, particularly with the types of music that are central to the version of accelerated learning explored in the study. Further, it is based on a version of accelerated learning (Suggestopedia), some of whose tenets have been critiqued as pseudoscience (↑Richards & Rodgers, 2012).

With only two studies substantially exploring EdTech and accelerated learning among children, this remains an area of research within which there are many gaps. Consequently, much of the insights in the remainder of this section will be based on literature that does not discuss accelerated learning narrowly, but instead technology for effective education delivery more broadly, with special focus on remedial education and EdTech for facilitating learner-centred pedagogy (a key component of accelerated learning programmes). Alongside the discussion of such literature, will be critical inference of how accelerated learning principles might be aided by EdTech. This inference will be built on insights from the discussion of accelerated learning in the previous sections and an exploration of EdTech for education more broadly, and especially in the context of the COVID-19 pandemic.

3.3.2. EdTech for remedial education

As suggested in the previous sub-section, there are promising signs that technology can support accelerated learning. With reference to the groups of learners discussed in Section 3.2, evidence also points to EdTech being a useful tool for the empowerment of even the most marginalised students;

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[5] Expository learning environments involve direct instruction and the use of examples to help illustrate concepts. In the cited study, it also involved gaining students' attention, motivation, revision, learning activities and summarising work.

such as girls, and perhaps even more so than for boys, if girls are given equal, and equitable, access to it (↑Webb, et al., 2020). More, though less direct, evidence of EdTech being a potential tool to promote accelerated learning for all learners can be seen when research is explored on how technology can be used for facilitating the pedagogical characteristics of, and approaches to, accelerated learning as outlined in Section 3.1. Firstly, this section discusses the personalisation of education delivery, followed by how technology enables access to education when otherwise there would not be and how EdTech might facilitate adults' further support for children's education. Within those discussions the characteristics of, and approaches to, accelerated learning are explored so that a sense of how different technologies might facilitate accelerated learning can be considered.

Personalised delivery of education through EdTech

Whilst there is no consensus on what 'personalised learning' specifically is, it generally refers to learning that is adjustable to individual learners' needs and is learner-centred and flexible – both also accelerated learning pedagogical characteristics and approaches (↑Groff, 2017; ↑Major & Francis, 2020).[6] Technologies that afford the highest levels of personalised learning and adaptability to the needs of learners are usually more complex technologies (such as computers, tablets and other smart devices) that can allow access to a wide range of digital content both online and off, in more languages than might be available for content created for low-tech options, while also providing (e.g.) real-time feedback. There is evidence to suggest that technology-supported personalised learning has the potential to help improve learning outcomes for students through a combination of interactive and learner-centred approaches and by developing students' socioemotional skills (↑Ignacio Casas, et al., 2014; ↑Gambari, et al., 2016; ↑Zaulkerman, et al., 2013). Notably, 'personalised learning' does not necessarily mean 'individualised learning', and so there is scope within a framework of personalised adaptive learning to incorporate adaptive group-level interactive activity. Students can also learn from their level, onwards, rather than beginning learning from a set level that might be beyond where they are at. This can help them to better understand the concepts they are taught, rather than moving ahead having not fully grasped basic knowledge (↑Banerjee, et al., 2007). Notably, much of the research on technology-enhanced personalised remedial learning in LMICs has focused on mathematics (↑Banerjee, et al., 2007; ↑Ignacio Casas, et al., 2014) and science (↑Gambari, et

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[6] A more detailed exploration of technology-enhanced personalised learning is the focus of another EdTech Hub rapid evidence review (↑Major & Francis, 2020) and so the discussion herein is brief.

al., 2016). Ways in which personalised technologies might enhance remedial learning in other subject areas is currently understudied.

This is not to say that the literature on mathematics and science is conclusive. Indeed, although results on technology-supported personalised learning, for mathematics and science are promising, the research in this area in LMICs is also very limited (↑Major & Francis, 2020). Therefore, claims should be tentatively interpreted. Further, technology that uses programmes that can be most effectively adapted to students' learning level and pace (such as computers, tablets and smartphones) are often more expensive and less easily accessible than technology that are less adaptive, but are also less expensive (such as radio, television and basic or feature phones) (↑Piper, et al., 2016; ↑Damani & Mitchell, 2020). It is these cheaper, less adaptive technologies that are often the most accessible in LICs (↑Damani & Mitchell, 2020). Therefore, while there is scope for personalised adaptive learning technologies to facilitate accelerated learning, they may not always be the most feasible option.

Access when there otherwise would be none

Another alternative, however, are those technologies mentioned above that may be less adaptive, but are more accessible in many LMICs. These technologies include radio and television (↑Damani & Mitchell, 2020; ↑Watson & McIntyre, 2020) and basic or feature phones (↑Casswell, 2019). The poorest households in many LMICs do not have reliable Internet access, with on 36% having any access at all due to insufficient infrastructure to allow for Internet access, or otherwise, access being too expensive for the average person (↑Vegas, 2020). Also unreliable and expensive at times is electricity, meaning that computing devices that require constant or frequent charging cannot be regularly used (↑Rozenberg & Fay, 2019). These problems are often worse in rural areas, where the reduced access to the Internet and electricity at home is exacerbated by the common reality that schools and community centres, where Internet and electricity might otherwise be accessed, are often further away from where children live than in urban areas (↑Aderinoye, et al., 2007). As such, low-tech, easy-to-access devices that facilitate learning are commonly the most accessible option.

Each of these types of low-tech devices have their associated affordances and challenges when it comes to speeding up learning and these will be briefly discussed in the following paragraphs. Notably, only radio and television, will be discussed below as there is a longer history of supporting literature on those topics; research on phones as an education tool in LMICs is a more

recent, and emergent, field[7]. Again, it should be noted that while there does not appear to be research in LMICs on how radio and television might specifically be used for learning within an accelerated learning programme, much has been written on how their use might facilitate accelerated learning. This is particularly through the pedagogical characteristics and approaches described in Section 3.1, and especially, interactive and learner-centred pedagogy. The following discussion of their use for accelerated learning will therefore be presented through that lens.

Radio. Radio broadcasts can be a cost-effective way to deliver education at scale as many households already have access to radio, including children living in the most deprived and distant, or rural, locales and in areas with limited Internet connectivity and access to electricity (↑Damani & Mitchell, 2020; ↑Anzalone & Bosch, 2005). Consequently, many countries across Sub-Saharan Africa, South-Asia and Latin America have developed and implemented radio broadcasts to help deliver education during the COVID-19 pandemic (↑World Bank, 2020). Historically, the most popular pedagogical programmes designed with radio in mind fall under the umbrella of Interactive Audio Instruction (IAI) (↑Bosch, 2004; ↑Potter & Naidoo, 2009; ↑Anzalone & Bosch, 2005). IAI are educational programmes that are delivered using an audio-only format, involving interactive elements (such as questions, and leaving time for answers) – this focus on interactivity may lend radio to incorporation into accelerated learning programmes. These audio formats could be pre-recorded on CD or MP3 and delivered using a radio, or another playback device, or otherwise can be broadcast over the airwaves, in which case it is referred to as Interactive Radio Instruction (↑Damani & Mitchell, 2020). Notably, IAI is most effective when the instruction is facilitated by a trained educator using learner-centred approaches; approaches which interactive audio instruction can, itself, also be instructive in helping teachers develop (↑Damani & Mitchell, 2020).

Television. Radio is, however, limited in what it can offer students educationally (↑Damani & Mitchell, 2020). Whilst an audio-only format may be sufficient, or even more beneficial to some learners, particularly if they are deaf or hard of hearing, learning formats that incorporate visual elements may be more helpful in the delivery of complex lessons and for those who can see. Despite televisions being more expensive than radios, they are still quite common and accessible in LICs, and many educational programmes have already been designed for it, including using interactive (learner with the TV-programme, as well as through co-viewing with others) and

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[7] Using mobile phone-based messaging apps, SMS (Short Message Service) and social media is the focus of another EdTech Hub Rapid Evidence Review by ↑Jordan & Mitchell (2020)

learner-centred pedagogy (↑Watson & McIntyre, 2020). There is also encouraging evidence that educational TV programmes might be useful in enhancing learners' social and emotional learning – another important aspect of accelerated learning (↑Moland, 2019; ↑Borzekowski, et al., 2019).

Importantly though, television, as well as interactive audio instruction, are largely cost-effective because of scale: when it can be used to deliver general education to many. Personalising educational television and radio content to the needs, and languages, of a few, can be expensive. Investment in more advanced technologies, such as computers and tablets, that allow access to a wider range of already-existing personalised content, may be a more sensible choice when complex lessons need to be delivered, and there is need for a high degree of personalisation by educational needs (↑Damani & Mitchell, 2020).

EdTech-facilitated support systems for learners

Finally, the efficacy of EdTech for supporting children's learning directly is not the only way in which technology might help to speed up learning. The pedagogical characteristics of, and approaches to, accelerated learning also deeply involve those adults who support learners. These include parents, caregivers, teachers and community members. Relatedly, technologies that support the adults by helping them to develop the knowledge, pedagogy, and skills to support learners' education, can also be useful for accelerating children's learning. Technology (radio) has, for example been used in raising awareness among community members, of the importance of education and the development of social attitudes enabling education, so that community members might be more supportive of children in the accelerated learning programme VAS-Y Fille! (↑International Rescue Committee (IRC), et al., 2017). It may also be an effective tool in teacher professional development; even for accelerated teacher professional development (↑Sharma, et al., 2018).

 Beyond the use of technology in the education of the adults in children's lives, technology might prove useful in providing faster diagnostic educational-needs assessment: an important aspect of effectively running an accelerated learning programme. Once the answers to a question can be scored by a computer, grading can occur immediately, leading to faster test results and quicker, less labour-intensive assessment of learners (↑Faber, et al., 2017). Further, in a specific type of computer-based assessment – Computer Adaptive Testing – that delivers questions according to the ability level of a learner, more precise diagnosis of learners' needs can be made in a shorter space of time (↑Martin & Lazendic, 2018; ↑Gershon, 2005) – albeit with some concern over the validity of the tests as every student may take a different test. There is also evidence to suggest that learners have a better experience of being evaluated through computer adaptive testing; those who know less

are not discouraged by being asked questions that are too difficult, and those who know more do not feel like they are wasting time answering questions that are too easy (↑Swierk & Tyrrell, 2015). That computer-based assessments also result in already digitised data, means that they can also help to speed up the process of programme monitoring and evaluation because data does not have to be manually entered into data analysis computer applications. Critically though, computer-based testing relies on familiarity with using computers and smart devices, as well as having access to them, which, as already noted, is not always possible in some LMICs (↑Martin & Lazendic, 2018). Further, there is limited evidence supporting their use as an assessment tool among children in LMICs. Computer adaptive tests can also be expensive to develop, as they require more specialised expertise for test development, and item calibration, than classical fixed-order tests (↑Martin & Lazendic, 2018). They may therefore not always be feasible.

4. Emerging evidence snapshots

Given the promise of accelerated learning, in and of itself, and as supported by technology, it might be expected that many accelerated learning programmes have been developed as a response to COVID-19-related learning loss. However, no specific examples of accelerated learning programmes were found. This may simply be because insufficient time has elapsed for such programmes to be comprehensively developed, or because the language that the searches for this review were conducted in (English) is not the language used to publish descriptions of emergent programmes. Alternatively, literature may not yet have been published that describe those programmes where they might exist. Though not popularly documented, these programmes do, however seem to be an emerging priority for educational stakeholders. ↑UNESCO (2020) explains that, "Most of them [countries] are preparing remedial or accelerated learning programmes based on assessment of students' learning experience during school closures to ensure continuity of curriculum…" However, Gwang-Chol Chang, Chief of section of Education Policy at UNESCO, explained that those efforts face several challenges (↑UNESCO, 2020).

Whilst there appears to be no literature describing specific programmes in the context of COVID-19, there is evidence of funding being made available to support the development of accelerated learning activities. Ethiopia, for example, has received a US$14.85 million grant from the Global Partnership for Education to support its response to learning loss due to COVID-19. The response is expected to include accelerated- and distance- learning activities (↑APO Group, 2020). Education Cannot Wait has also given emergency funds to various education providers to support their response to COVID-19 (↑Education Cannot Wait, 2020a; ↑Education Cannot Wait, 2020b). Yasmin Sherif, director of Education Cannot Wait, notes that:

"This emergency investment empowers: Ministries of Education in developing catch-up programmes and condensed curricula to prevent loss in the school year; production of distance learning material for pre-primary, primary and secondary levels; home-based learning and special measures for children with disabilities; expansion of radio and television education; COVID-19 awareness raising for children, parents and teachers; disinfection of schools; access to improved water and hygiene facilities and supplies; psychosocial counselling; and, the continued payment of teachers' salaries during the crisis." (↑Sherif, 2020)

Notably as well, the use of accelerated learning, as an appropriate route to addressing learning losses related to COVID-19, is also a popular suggestion across the international education community (↑Mundy & Hares, 2020;

↑Accelerated Education Working Group & Inter-agency Network for Education in Emergencies (INEE), 2020; ↑Sarfraz, 2020; ↑Azevedo, et al., 2020).

5. Synthesis

Given all that has been discussed concerning accelerated learning, a final question arises about whether accelerated learning should be used as a response to the COVID-19-related learning loss? The answer to this question is a qualified 'Yes'. The pedagogical characteristics of, and approaches to accelerated learning, outlined in this review, should be considered in COVID-19 education recovery efforts. However, the number of aspects of accelerated learning that should be employed will vary by context. It is likely that helping students to catch-up on missed learning will involve at least some of the elements of accelerated learning discussed in this review.

Implementing a full accelerated learning programme in a short space of time is no small endeavour. It involves the implementation of diagnostic educational needs assessment, teacher professional development in interactive pedagogy, community, parental and caregiver awareness of how to be effectively engaged in student learning, as well as the creation of instructional material appropriate for an accelerated learning programme. Also critical is the provision of social and emotional support for learners, teachers and other supporting adults, especially considering the traumas associated with the pandemic. Whilst a full accelerated learning programme may not always be the most feasible choice for education in response to the pandemic-related learning losses, a scaled back programme may be. Deciding which elements of accelerated learning to include in a scaled-back programme will vary by the educational and psychological needs of the learners being targeted, the existing infrastructure and human resources to support accelerated learning, teachers' professional development needs, time and financial support.

The question can be extended to interrogate whether technology should be used in those programmes. The answer to this is a less clear 'Perhaps, but not necessarily'. Where infrastructure already exists to support technology-enhanced learning, or there are funds available to support such, a technology-enhanced accelerated learning programme may be an appropriate response. However, there is evidence to suggest that large relative learning losses are related to a lack of motivation, not having books at home as well as not having sufficient support from primary caregivers, more so than EdTech (↑Sabates, et al., 2020). Therefore, while EdTech is still a worthwhile consideration in contexts where the infrastructure to support it does not yet exist, there should be more thorough consideration of whether available funds may be more appropriately allocated to other aspects of accelerated learning, than EdTech. These considerations might include condensing the curriculum and producing related paper-based materials and

improving teacher professional development and community and caregiver engagement to enhance education delivery and support.

There remain significant gaps in our understanding of how children's accelerated learning might be enhanced through EdTech in LMICs, and especially in light of emergencies such as the present pandemic. Further research is therefore needed. Amongst those blindspots that remain to be substantially addressed are how, and whether, EdTech might be used to enhance children's social and emotional learning and safety, the types and affordances of EdTech that are most appropriate in accelerated learning programmes for students of different ages and cognitive development stages, and how and whether EdTech should be used in improving diagnostic needs assessment in accelerated learning programmes. Additional research into the best pedagogical approaches (learner-centred, teacher-centred, a mixture, or something else entirely) for EdTech-facilitated remote learning, and for increasing community awareness and support of accelerated learning will also be beneficial.

Finally, it is worthwhile to note that while there is a fair amount of research in HICs on accelerated learning for 'gifted' children, and secondary school students seeking advanced tutoring to help them into higher education, these areas remain under-researched across LMICs. Much of the research on accelerated learning in LMICs focuses on children who are in need of foundational, primary education, but are over-age and/or out of school. It cannot yet be evidenced that an accelerated learning programme in a LMIC, that targets secondary or pre-tertiary education and children who are not over-age, will result in increased learning. The COVID-19 pandemic has highlighted the need for such research. There is a need to better understand how accelerated learning might be capitalised on for the 'average' or 'advanced' student, who has missed schooling, especially as facilitated by EdTech. Within all of those realms of further research, there is a need to additionally explore safeguarding concerns for children–such as protecting children online, data privacy, and other ethical considerations– especially as the use of EdTech grows across LMICs.

In sum, a specific, one-size-fits-all, prescription to an accelerated learning programme in response to COVID-19 learning loss cannot be provided. It is up to individual education providers to consider and weigh all options in light of available and sustainable resources to then decide the best route forward. However, the limited evidence on accelerated learning and EdTech does suggest that implementing an EdTech-enhanced accelerated learning programme may be beneficial, and it is therefore worth considering it as an option for addressing COVID-19-related learning loss.

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7. Annex B: Search terms

The following search string was used for initial literature searches:

> (accelerated adaptive learning; accelerated curriculum; accelerated
> e-learning; accelerated education programme; accelerated instruction;
> accelerated learning; accelerated learning; accelerated learning
> children; accelerated learning children; accelerated learning
> programme; catch-up learning; complementary education; intensified
> learning; intensive learning; rapid learning children; Rehabilitation
> education children; remedial education technology; speed school; speed
> up learning using technology; technology for accelerated education;
> accelerated teaching children)

Table 1. *Search terms.*

Source	Search terms	Records returned	Studies screened	After title and abstract screening*
SCOPUS	accelerated adaptive learning	34	34	2
SCOPUS	accelerated curriculum	314	314	15
SCOPUS	accelerated e-learning	40	40	3
SCOPUS	accelerated education programme	265	265	62
SCOPUS	accelerated instruction	167	167	11
GS	accelerated learning	930000	500	98
SCOPUS	accelerated learning	5068	500	36
SCOPUS	accelerated learning children	113	113	15
GS	accelerated learning	141000	500	76

	children			
SCOPUS	accelerated learning programme	284	284	45
GS	catch-up learning	257	257	18
GS	complementary education	3400	500	18
SCOPUS	intensified learning	304	304	4
SCOPUS	intensive learning	4195	500	36
SCOPUS	rapid learning children	705	500	13
SCOPUS	Rehabilitation education children	153	153	1
SCOPUS	remedial education technology	200	200	46
GS	speed school	2090	500	6
SCOPUS	speed up learning using technology	141	141	10
GS	technology for accelerated education	767000	500	45
SCOPUS	accelerated teaching children	67	67	5
Total		1855797	6339	515*

*After the title and abstract screening, 99 studies were later removed after deduplication. This brought the total number of studies that were found through the above searches, that were screened on full text, to 416.