

# EdTech Hub

Clear evidence, better decisions, more learning.

## Country-Level Research Review: EdTech in Kenya

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## Executive summary

This document presents a review of the research landscape in Kenya in relation to EdTech research focused at the level of school-based education (not including higher education). The search strategy identified research literature, policy documents, grey literature, and communications with key experts and stakeholders. A growing body of relevant EdTech research is identified to have been undertaken in Kenya. After undertaking searches for relevant literature since 2007, 87 research articles or papers were identified for inclusion. The review provides an overview of trends in this literature in addition to identifying key actors and projects. It also considers how existing research on EdTech in Kenya relates to five research topics that will be the focus of future EdTech Hub research. In combination with political economy analysis, the research identifies potential areas for new research which would be practical and likely to have high impact.

# 1. Introduction

This review provides an overview of EdTech research in and about Kenya. It does so in order to identify the opportunities for further EdTech-related research in the country and to understand how EdTech Hub can collaborate with researchers, practitioners, and policymakers most effectively. The report will be important for researchers in Kenya and the surrounding region, as well as for EdTech implementers seeking to understand what evidence exists and what is needed. Through analysis of existing literature, discussions with key stakeholders and experts, and analysis of the broader political economy, the gaps in evidence which have the highest potential for impact on education are identified to inform future research priorities. These priorities will also serve to foster and sustain conversation within a community of practice and learning shared by education stakeholders.

## 1.1. Structure

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The review is made up of seven sections:

1. Introduction
2. Summary of the EdTech operating context
3. The texture of the EdTech research landscape
4. Key stakeholders within the EdTech research landscape
5. Summary of the academic evidence on EdTech
6. Summary of political economy analysis
7. Emerging priorities and opportunities for collaboration

## 1.2. Methodology

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To address the aims of the review, a combination of approaches were used in order to draw upon a range of sources.

Analysis of background demographic statistics and policy documents informed the context (Section 2), and political economy analysis (Section 6). Section 2 in particular drew upon previous work undertaken by the Engagement team within EdTech Hub ([↑Otieno & Taddese, 2020](#)).

A review of published academic research literature was undertaken to provide an overview of the existing research landscape around EdTech and education for school-aged learners in Kenya (Section 3). This provides an overview of trends – and current gaps – in addition to identifying key actors and projects. It also considers how existing research on EdTech in Kenya relates to the five research topics that will be the focus of EdTech Hub’s research (Section 5). The research review also provided a way of exploring key academic stakeholders related to EdTech in Kenya (Section 4). The volume of EdTech-related research in Kenya has been increasing in recent years and 87 academic publications were identified for inclusion. The search process and its limitations are described in Section 3.

Interviews with stakeholders informed several aspects of the report, in particular the political economy analysis (Section 6). Situating the priority research areas within the political economy analysis also brings a practical dimension. Potential directions for high impact research in Kenya, aligned with the priorities within the country and with those identified by the Hub, are outlined in Section 7. Each section starts with an overview of the data sources used.

## 2. Summary of the education operating context

This section provides an overview of Kenya’s education sector operating context. The section begins with a brief overview of national contextual factors which influence the delivery of education in Kenya. This is followed by a brief review of primary and secondary education service delivery. The section finishes with a description of education service delivery since the onset of the COVID-19 pandemic. By providing an understanding of the education sector more broadly, this section helps position the insights into the EdTech research base presented in subsequent sections.

### 2.1. Country context

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Kenya is home to a population of approximately 52.6 million people living across a diverse range of contexts ([World Bank, 2021](#)). These include the metropolis of Nairobi, the long eastern coastline bordering the Pacific Ocean, the fertile lands of the Great Rift Valley, the deserts of northern Kenya, and the savannah of the Masai Mara. The national language is Kiswahili, but there are two official languages: Kiswahili and English.

Kenya’s population is young, and is growing quickly. Approximately 39.1% of citizens are aged between 0-14, there is a median age of 19.7 years (half that of the US and China) and the population growth rate is 2.3% per year ([↑World Bank, 2021](#); [↑World Bank, 2021](#); [↑World Bank, 2021](#)).

Kenya is often viewed as a leader and an exemplar of good development practices within the eastern and southern region of Africa. As of 2020, Kenya had a Human Development Index value of .602, placing it 143rd out of 189 countries and within the medium category on the Human Development Index ([↑United Nations Development Programme, 2021](#)). This contrasts with neighbouring countries such as Uganda (index of .544 and ranking of 159), Rwanda (.543 and ranking of 160) and Nigeria (.539 and ranking of 163). Kenya’s 2020 standing is an improvement from 2019, when its value was 0.579, placing it 147th of 189 nations.

Despite good development progress, the country experiences significant levels of disparity. For example, income inequality is extreme. The top 0.1 percent of Kenyans possess more wealth than the bottom 99.9% ([↑Otieno & Taddese, 2020](#)). This inequality often manifests along geographic lines. For example, of the 14.5 million people living in urban areas (27.5 percent of the population), 84 percent have access to electricity. This contrasts with only 71 percent in rural areas. Table 1 includes an overview of key indicators that provide insight into Kenya’s general development.

**Table 1. Country overview.** Source: Adapted from [↑Ministry of Education, Republic of Kenya, 2018](#); [↑United Nations Development Programme, 2020](#), [↑Otieno & Taddese, 2020](#); [↑Kaye, 2021](#); and [The World Population Dashboard](#).

<b>Population indicators</b>	Total population (2021)	The population is 55 million. The growth rate is 2.3% per year.
	Age (2021)	59.4% of the population is aged 15–64. 38.0% of the population is aged 0–14.  Median age: 19.7 years.
	Urban / Rural divide	Percent of population urban: 27.0% Percent of population rural: 73.0%
<b>Development indicators</b>	Human development index	0.601
	Life expectancy	66.7 years.

	Fertility rate	3.79 births per woman.
	Poverty	Percent of population living in poverty: 36.8%
<b>Digital indicators</b>	Mobile phones (2020)	Mobile penetration: 98% Mobile connections: 52%
	Internet (2020)	Internet penetration: 43%

NB - Figures are from 2019 unless otherwise state

## 2.2. Education in Kenya

In the leadup to the new millennium learning in Kenya had stagnated. Access was low, with primary net enrolment only just over 60 percent in 1999 ([↑World Bank, 2021](#)). Learning outcomes for those children in school also remained well below international averages. Noting these challenges, the Kenya government embarked on two phases of ambitious education reforms - first focusing on access and then on improving education quality. These reforms are part of the government’s ongoing commitment to build a high-quality education system that meets the needs of its citizens and the state, while also acknowledging the complex socio-economic, political and cultural dynamics. The reforms also provide a foundation for Kenya to make the most of a potential demographic dividend which will emerge over the coming years. It is estimated that by 2050 Kenya’s working age population will be 73 percent which has the potential boost GDP per capita to 12 times the current rate if circa 90 percent of the population are formally employed ([↑Kibaru-Mbae & Chatterjee, 2016](#)).

In 2003, free primary education was introduced nationally, and was shortly thereafter, in 2008, followed by free secondary education ([↑Kaye, 2021](#)). These reforms, designed to increase access to education, have led to universal primary enrolment. Gross enrolment in secondary education increased to above 70 percent in 2018 ([↑Otieno & Taddese, 2020](#)). These reforms also tried to increase equity across genders. Again, this has been successful, with the gender parity index reaching 0.97 (97 girls enrolled for every 100 boys) in primary and 0.95 in secondary ([↑Otieno & Taddese, 2020](#)).

As enrolment rates have increased, the focus of reform has shifted to increasing education quality. Since circa 2013 the government has deployed a number of reforms aimed at enhancing education quality. Examples include developing a competence-based curriculum, more support for teacher development, and a move to enhance community engagement by creating localised school boards of management. These reforms have already begun to lead to increases in education outcomes reflect in regional testing results ([↑Kaye, 2021](#)).



### 2.2.1. Education system governance

Oversight and governance of Kenya's general education system (i.e. primary and secondary) is the responsibility of the Ministry of Education, Science and Technology (MoEST). The MoEST is mandated by the constitution of Kenya to provide quality and affordable education to all Kenyan children ([↑Otieno & Taddese, 2020](#)). The MoEST's Department of Early Learning and Basic Education is responsible for defining and delivering policies and programs for primary and secondary education.

In addition to the MoEST, semi-autonomous and autonomous government agencies (SAGAs) play key roles in education delivery. These SAGAs, which include the Teacher Service Commission, the Kenyan Institute of Curriculum Development and the Kenya National Examination Council amongst others, play important roles related to discrete areas of education service provision.

A recent devolution of power to local governments has shifted the nature of education management and governance in Kenya. In 2010 a new constitution was introduced that empowered Kenya's 47 counties to play a greater role in public service delivery. This includes the oversight of education provision. This change resulted in the creation of county and sub-county offices in each municipality with the idea that this would ensure that the MoEST was able to better engage with local groups and better meet local needs. This shift altered lines of accountability for service delivery and quality, with county-level officers now conducting quality assurance, inspection, and teacher training.

Finally, Kenya's education system governance is made more complex by the substantive roles played by actors such as development partners, non-government organisations and the private sector. In Kenya, official development assistance (ODA) received from aid organisations is significant, with ODA comprising 6 percent of Kenya's gross national income ([↑World Bank, 2015](#)). Non-state actors play important roles in the delivery of education more broadly, but also the implementation of interventions that leverage EdTech specifically. For example, non-government actors as diverse as Safaricom (the national telecommunications provider), the World Bank and the Keep Kenya Learning campaign (a collaboration of both private and NGO education providers) support education delivery.

### 2.2.2. Education system characteristics

Kenya's general education system comprises three main phases. These are:

- Early childhood development and education - Ages 3 - 5.
- Primary education - Ages 6 - 13

- Secondary education - Ages 14 - 17

In addition to these phases, the system also comprises both formal and non-formal opportunities for vocational and technical training (generally available from approximately age 10 and up).

Table 2 contains key education service delivery indicators.

**Table 2.** *Key education service delivery indicators (2016–17). Source: Adapted from [Otieno & Taddese, 2020](#); [Ministry of Education, Republic of Kenya, 2018](#); [Ministry of Education, Republic of Kenya, 2019](#)*

<b>Pre-primary</b>	Learners	Total: 3.39 million  Females: 1.66 million Males: 1.73 million  Net enrolment: 77.2%
	Institutions	42,317
	Teachers	Total: 92,359  Public: 52,780 Private: 39,579
<b>Primary</b>	Learners	Total: 10.54 million  Females: 5.18 million Males: 5.36 million  Net enrolment: 92.4%
	Institutions	Total: 37,910  Public: 24,241 Private: 13,669
	Teachers	Total: 350,532  Public: 218,760 Private: 68,772
	Completion	Primary completion rate: 84.2%
<b>Secondary</b>	Learners	Total: 2.94 million  Females: 1.44 million Males: 1.51 million  Net enrolment: 53.2%

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Teachers	Total: 350,532
	Public: 218,760
	Private: 68,772

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Teachers	Total: 116,910
	Public: 105,234
	Private: 11,676

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It is important to expand upon and explicitly highlight some of the indicators contained in Table 2. These include:

- As mentioned above, enrollment rates have increased considerably over the last two decades. While these rates have increased, there are still significant drop-offs. These generally occur at education transition points (e.g. from primary to secondary, or secondary to tertiary) ([↑Otieno & Taddese, 2020](#)). Child labour continues to impact education participation and the ability to achieve high learning outcomes. Approximately two thirds of children aged 5 to 11 work at least an hour a week for payment. More than 10 percent of children aged 12 to 14 work more than 14 hours per week ([↑Kaye, 2021](#)).
- The macro level figures shared throughout this section conceal significant educational disparities between different regions in Kenya. For example, enrollment varies substantially across counties. Low rates are particularly prevalent in arid and semi-arid counties ([↑Otieno & Taddese, 2020](#)). The majority of the 1.1 million Kenyan children estimated to be out of school are from these counties. Other areas of significant disparity include coastal areas and urban slums ([↑World Bank, 2015](#)).
- The quality of teaching in Kenya remains low by international standards. There is a lack of qualified teachers to staff schools, and where teachers are in place, capacity is often low. It is estimated that there is a shortage of nearly 100,000 teachers, and this is expected to continue to increase over time ([↑Otieno & Taddese, 2020](#)). Even where teachers are employed, a recent survey found that 16 percent are absent from school, and 29 were in school but not teaching ([↑World Bank, 2015](#)).
- Supporting children with special needs remains a significant challenge in Kenya. Only 39 percent of students with disabilities access primary education, and only 9 percent access secondary ([↑Angoye, et al., 2020](#)). This lack of inclusion is linked to deficits in infrastructure, a lack of relevant equipment, a lack of training for teachers on how to meet learner needs, and societal limitations.

### 2.2.3. Reform priorities

Kenya's National Education Sector Strategic Plan sets out the reform priorities for Kenya between 2018 and 2022 ([↑Ministry of Education, Republic of Kenya, 2018](#)). These are:

- to enhance access and equity;
- to provide quality and competency-based education, training and research;
- to strengthen management, governance and accountability; and
- to enhance relevance and capacities for Science, Technology and Innovation(ST&I) in education, training and research for labour markets.

This reflects the Kenyan government's public commitment to strengthen and deepen the reforms that have already been in progress for some years now, with a real focus on increasing education quality. The focus on ST&I also reflects the Kenyan government's aim to develop a workforce that is equipped to drive national prosperity in the 21st century. This aligns with the plans and policies of other government agencies such as the National Information, Communications and Technology policy, which articulates the aim to:

- Integrate ICT at all levels of education;
- Create a nation-wide e-Education system to support schools;
- Retrain and reskill the current workforce on ICT;
- Establish educational networks for sharing resources and promoting e-learning; and
- Facilitate public-private partnerships to mobilise resources e-learning initiatives.

This kind of alignment between policy and reform priorities indicates that the shift to position Kenya to be a leader in relation to the adoption of digital technology goes beyond just the education sector and is integrated into ambitions and reforms across the country as a whole.

## 2.3. Impact of Covid-19

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Like most countries, Kenya's education has been significantly impacted by Covid-19. Approximately 17 million learners across the country had their learning disrupted by school closures ([↑Jelimo, 2020](#)). The first Covid-19 case was recorded in Kenya on 13 March 2020, with the government announcing schools would close on 15 March 2020.

The government moved quickly to deploy a range of solutions to support learning continuity whilst schools were closed. Multiple modalities, including television, radio and internet, were all leveraged to deliver content to students

at home. The Kenya Basic Education Covid-19 Emergency Response Plan was launched in May 2020 to try to ensure the various modalities were being implemented as a cohesive, integrated package ([Ministry of Education, Republic of Kenya, 2020](#)). The plan aims to:

- Provide learners with access to quality and equitable education to ensure continued learning during and after the Covid-19 crisis;
- Facilitate the production of online teaching and learning materials, and to expand existing distance learning provisions;
- Train teachers to effectively support distance learning, including monitoring and assessment;
- Develop and implement intervention programmes targeting the marginalized and most vulnerable learners especially girls and children with special needs; and
- Provide psychosocial support to learners, teachers, education officials and other stakeholders.

The plan integrates activities designed to support a coordinated approach to providing students with learning continuity. This includes creating additional content (text, audio, video, interactive, etc.) that can be accessed via various modalities (TV, radio, internet, etc.). It also includes strengthening existing mechanisms designed to support distance learning such as the Kenya Education Cloud, and procuring new and better equipment to create digital content. Importantly, the plan also includes a focus on increasing teacher capacity to support students to make the most of distance learning tools.

This plan has received funding from the Global Partnership of Education to support implementation through the Learning Continuity in Basic Education Project (LCBEP). The latest implementation status report (March 2021) indicates that implementation of the LCBEP is considered satisfactory ([World Bank, 2021](#)). The report highlights that considerable proportions of students are accessing the various educational modalities. This includes 69.29% of learners accessing EDu TV programming, 42.26% accessing radio lessons, 22.09% accessing content on YouTube and 17.02% accessing the Kenya education cloud.

This high level of uptake was driven through various project initiatives, including the creation of nearly 2,500 interactive lessons that are accessible via TV, radio, internet and social media. Approximately 250 tips have also been created and shared with parents to support them to guide children to learn at home. Training for teachers is developed and is expected to reach 150,000 teachers by April 30 2021. This work has been particularly important due to the ongoing closure of Kenyan schools. While schools were re-opened in January

2021, as of April 2021 they have been closed again following another increase in Covid-19 cases.

Finally, it is important to note that the government's focus has gone beyond simply responding to the Covid-19 crisis. Strategies and implementation plans all highlight an awareness of the fact that the shocks felt in the short term have the potential to be ongoing, and that a robust response to the current closures will lay the foundations for resilience in the face of future shocks.

### 3. The texture of the research landscape on EdTech

This section provides an overview of the existing research landscape in relation to EdTech in Kenya. EdTech research has been actively undertaken in Kenya and the Kenyan EdTech ecosystem was described as one “of the most vibrant in Africa” by [Otieno & Taddese \(2020, p.17\)](#). Consequently, there is an existing body of EdTech research which EdTech Hub can build upon. The characteristics of this research will be illustrated in this section. This analysis of the literature will also inform the introduction of authors and major projects related to EdTech in Kenya in Section 4.

A strategic approach was adopted to search for published EdTech research literature. Given that ‘EdTech’ is an umbrella term which encompasses a wide range of subjacent terms, approaches, and technologies, searches were conducted with a primary focus on ‘Kenya’. The search strategy included four steps (undertaken in the following order):

1. Initial searching of key EdTech research documents for Kenya-focused studies. This included existing reviews of EdTech studies in LMICs (for example, [Rodriguez-Segura \(2020\)](#)), evidence reviews, and EdTech Hub publications (for instance, [Otieno & Taddese \(2020\)](#) and [Haßler et al., \(2020\)](#));
2. Searching specialist education research databases (ESSA, Academia.edu, ResearchGate) for all Kenya-focused studies and selecting those which met the inclusion criteria (published since 2010, being EdTech-related, and focused on school-aged learners, teachers, or aspects of the educational system relevant to school-aged learners);
3. Searching general academic databases (Scopus, Google Scholar) for ‘Kenya’ and a range of general EdTech terms listed in Annex A (such as educational technology, e-learning, technology-enhanced learning, MOOCs, ICT, mobile learning);

4. Snowballing searches for further articles from authors identified as prominent in the literature, in addition to generic search engine searches to identify further potentially relevant information or 'grey literature'.

While it is not possible to guarantee that the search results are exhaustive given the wide range of technologies and approaches that can be considered 'EdTech', a level of saturation was considered to have been reached when implementing the search strategy as continued searches did not produce further results meeting the criteria. Thus, although this approach stops short of being a 'full' systematic review (not least because it was undertaken in a relatively short period of time), the sample is considered to offer an accurate representation of the EdTech research literature focused on school-aged learners, teachers, or aspects of the educational system relevant to school-aged learners in Kenya.

Articles identified through the search process were read in full, and information about those which met the search criteria were entered into a spreadsheet, mapping their characteristics to a pre-defined 'research landscape index' (RLI) framework. 87 articles, written by 150 unique authors, were entered into the RLI (accessible [here](#)). Categories within the RLI included: bibliographic information; authors; institutions; funders; research methods; sample size; study topic; and relevant Hub thematic area (each presented as subsections in Section 5).

Of the 87 articles selected for this review, 76 are academic papers and 11 fell within the grey literature. The majority of the EdTech literature in Kenya is based on empirical research (60%) followed by exploratory research. Only four theoretical studies were found through our literature search strategy. There is an almost equal distribution of literature focussing on learners, teachers and systems in the context of EdTech in Kenya.

With respect to study sizes, the literature includes studies that cover a range of stakeholders within the EdTech ecosystem, with several studies featuring more than one stakeholder. The literature also includes a wide range of sample sizes, with some studies including over 3000 participants and others as low as three, as shown in table below. Box plots of sample sizes are shown in figure 1 (a minimum threshold for number of studies with a specific participant was set at 5 for the box plot). Research methods in the Kenyan EdTech literature varied across studies with surveys and questionnaires contributing to over 40% of the studies, followed by content and thematic analysis and mixed methods approaches.

Stakeholder/participant	Obs	Mean	Std.Dev.	Min	Max
Teachers	36	117.5	216.3	3	1100
Students	21	524.3	707.4	5	3030
Schools	20	33.15	35.52	2	105
Principals	5	12.8	5.891	8	23
Headteachers	3	150.7	163.1	40	338
Administrators	3	17.5	19.09	4	31
University Lecturer	2	20.5	27.58	1	40
Adults	2	1371	1455	342	2400
MoE Officials	2	3.5	0.707	3	4
Communities	1	8	.	8	8
Tutors	1	71	.	71	71
ICT Heads of Departments	1	12	.	12	12
Parents	1	29	.	29	29
Curriculum Developers	1	80	.	80	80

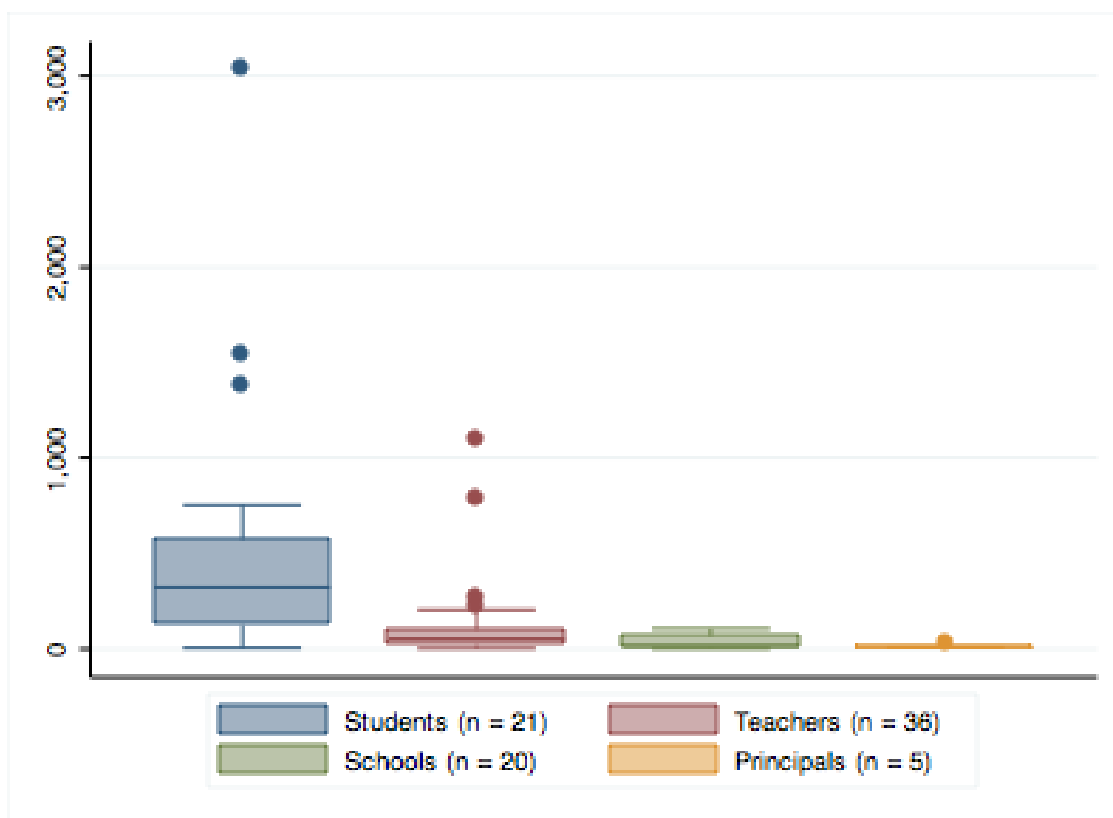
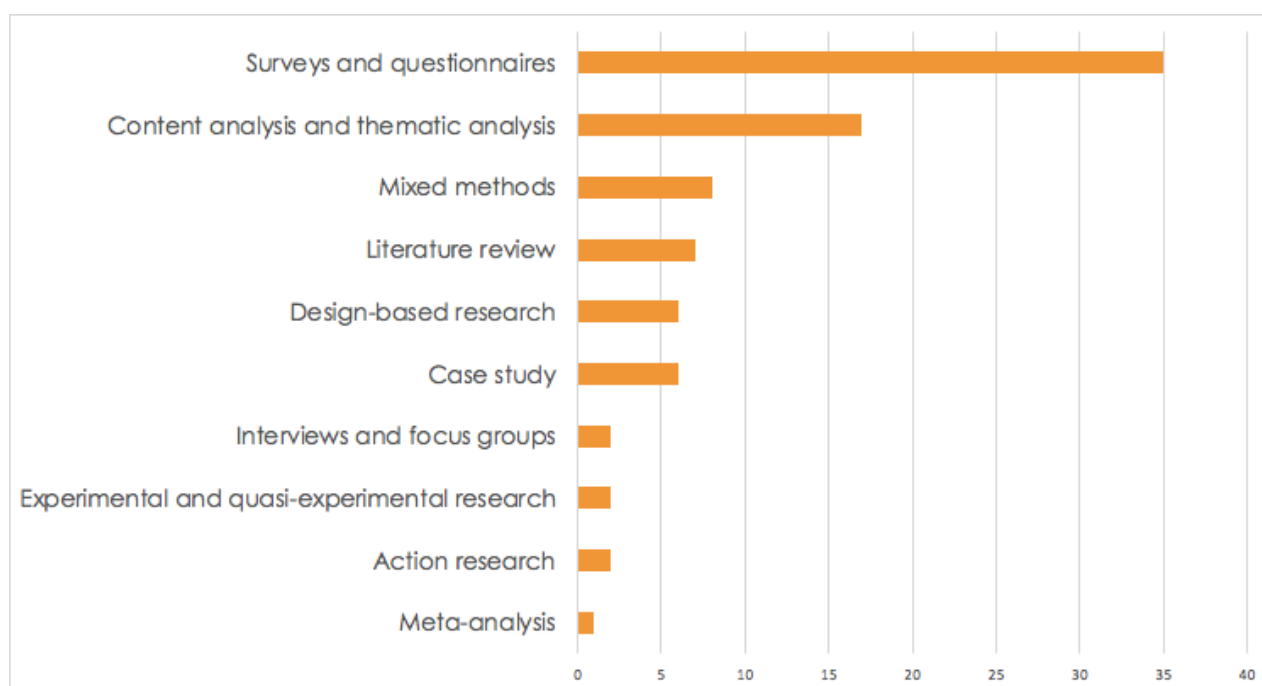


Figure 1: *Boxplot of sample sizes in the articles included in the Kenya literature review.*





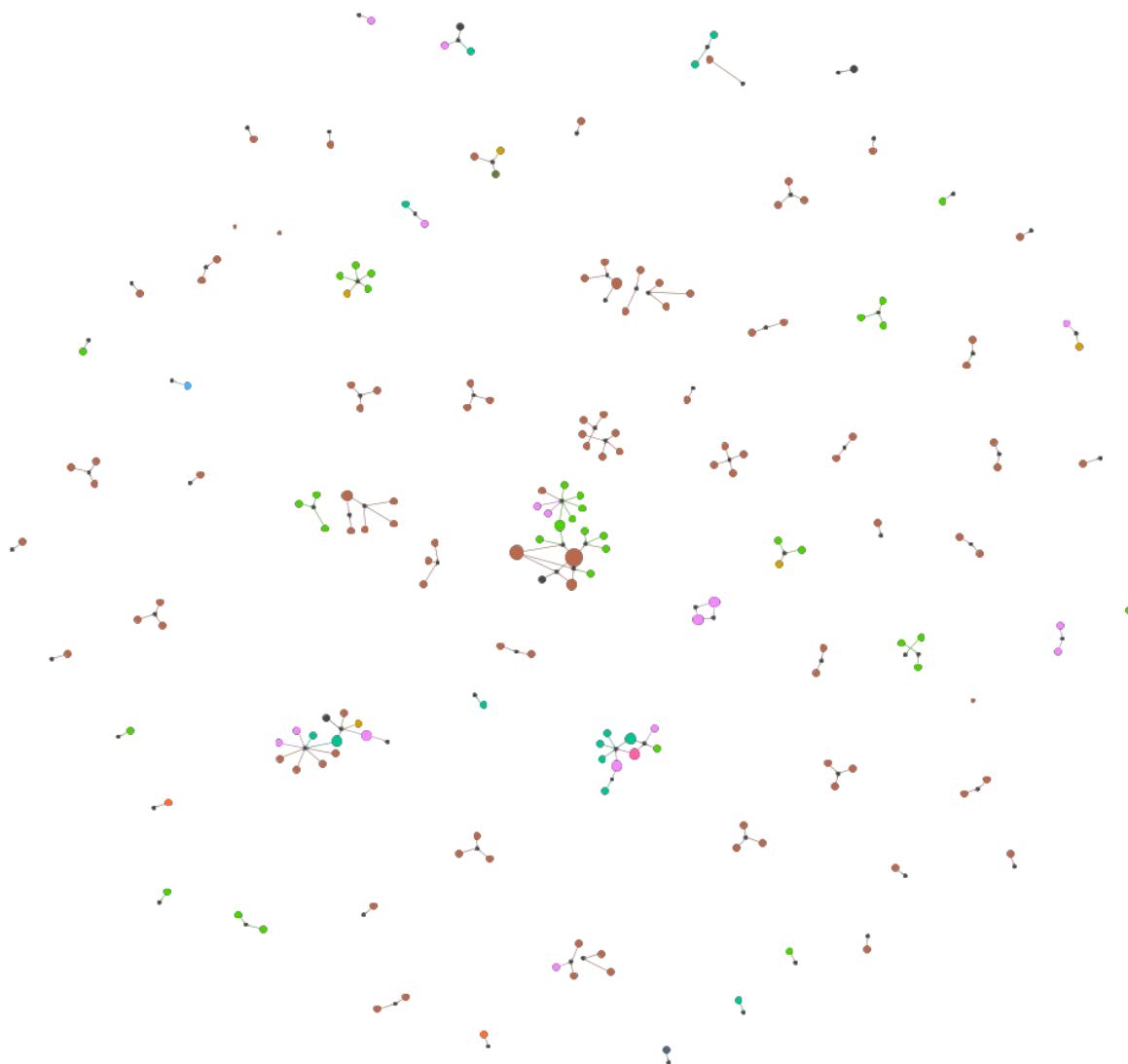
**Figure 2:** Frequency of research methods using the RLI typology in the articles included in the literature review.

## 4. The key stakeholders within the research landscape on EdTech

This section provides an overview of some of the individuals and organisations active in conducting EdTech research in Kenya. The information in this section may not be exhaustive as most of this information is sourced from the rapid scan paper authored by [Otieno & Taddese \(2020\)](#), articles that have been published, and primarily academic journals. For example, researchers who have not published in outlets which are indexed by the databases, or are working on EdTech projects which have not reached the publication stage yet, will not be included. Furthermore, the inclusion criteria for the literature review limited the search to EdTech in the context of school-aged learners, teachers, or aspects of the educational system relevant to school-aged learners; this would also exclude Kenya-based academics with EdTech research interests in relation to higher-education (search terms for the literature review are listed in *Section 9.1 Annex A*). Although the research strategy was intended to be as inclusive as possible, this source is unlikely to include all the individuals working on EdTech in Kenya. Nonetheless, the authorship of the articles included in the literature review is one way of exploring the academic research

community with interests related to EdTech in the context of school-aged learners and teachers in Kenya.

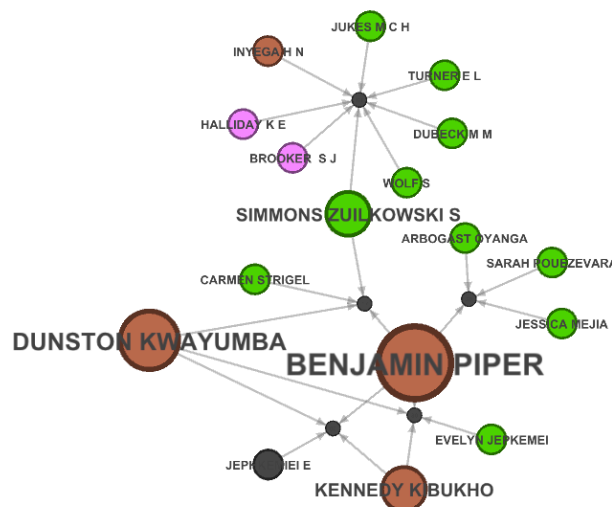
Figure 3 depicts a co-authorship network of links between papers and their authors, within the reviewed academic literature. The characteristics of the data visualisation in Figure 3 reveal insights into the academic community related to EdTech research in Kenya. The many different nodes and independent clusters demonstrate on the one hand a diverse ecosystem of research, able to support a wide range of work independently. This also is consistent with the observations extracted from the interviews conducted for this scoping review, which will be presented in Section 6. These refer to a fragmented landscape, with little collaboration amongst educational institutions.



*Figure 3: Co-authorship network of the 87 papers included in the Kenya*

literature review. Links connect authors (coloured nodes) to articles (grey nodes). Node size is scaled according to the number of articles authored in the sample. East Africa (brown), USA (bright green), Europe (pink), UK (aquamarine), China (orange), South Africa (blue), South-east Asia (green), West Africa (bright pink), Australia (blue-grey). Authors who were not clearly associated with a particular location are shown in gold.

As illustrated in Figure 4, the majority of the research projects (57%) are led by academic groups based in East Africa (mostly Kenya). A large number of academic groups (28%) are also led by researchers in the US and Europe (including the UK) and 10% of the studies were conducted by international collaborations. A co-authorship network graph shows a fairly dispersed EdTech research community highlighting opportunities to build further collaborations. However, a number of international collaborations do exist and three prominent research clusters have emerged (we highlight clusters where at least one author is from East Africa, an author has been involved in two or more studies, and have international collaborations). Two of these clusters include authors from East Africa.



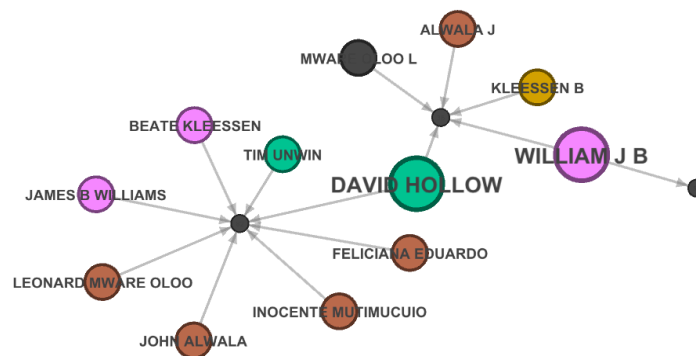


Figure 4: Co-authorship network of three of the largest research clusters in the EdTech literature for Kenya.

This section will now turn to provide an overview of some of the key stakeholders that emerged primarily from the research literature review, with reference to the co-authorship network, arranged according to three sub-sections: first, academics based in Kenya; second, major EdTech projects; and third, research organisations with interests related to EdTech research in Kenya.

## 4.1. Leading academics and independent researchers

The distribution of authors affiliated with Kenya-based institutions in Figure 2 suggests that there is a large and active research community around EdTech; however, the co-authorship network is quite fragmented, which may suggest that there is more scope for collaboration and network-building. Some of the most prominent Kenya-based academics, who have authored multiple papers in the sample and have online profiles, are listed below.

### 4.1.1. Benjamin Piper

Benjamin Piper is the Senior Director for Africa Education at RTI International, based in Nairobi, Kenya. Dr. Piper provides technical support to programmes across the world and is the Principal Investigator for several RTI projects. Dr. Piper also supervises Kenya's national literacy program: Tusome Early Grade Reading Activity (2014–2021) (see Section 4.2.1). Dr. Piper's interests include instructional improvement, policy reform, evaluation, and early childhood development. He has experience in programme management, instructional leadership, pedagogical improvement, policy analysis and assessment and has worked with the World Bank, the U.K. Department for International Development, UNICEF, and Save the Children.

### **4.1.2. Dunston Kwayumba**

Dunston Kwayumba is a research, monitoring and evaluation specialist with over 10 years of experience in research as well as in programme monitoring and evaluation in Kenya. He has worked on various projects related to education, health, agriculture and gender equality, in Kenya and internationally. He has also worked on a number of projects for the United Nations, Care International, USAID, SNV Netherlands, Save the Children International, SIDA, World Bank and the Government of Kenya.

### **4.1.3. Kennedy Kibukho**

Kennedy Kibukho is a project management, and monitoring and evaluation specialist with over 17 years' experience in project design, monitoring, evaluation, research and learning and works across various sectors including water, sanitation and hygiene (WASH), health, resilience, food security, gender, education and advocacy. His expertise is action research and participatory program design and monitoring and evaluation and has overseen large scale projects such as the ~\$74 million USAID Tusome Early Grade Reading Program (see Section 4.2.1). He is currently at Tetra Tech International Development as the Monitoring and Evaluation Manager for its Africa Clean Energy Programme.

## **4.2. EdTech research projects**

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This section introduces an overview of some of the main large-scale EdTech research projects (in terms of number of learners reached) undertaken with relevance for education of school-aged learners in Kenya. Note that, as the purpose of this section is to provide an overview of the EdTech research projects found in the search. A closer look at evaluation of these projects and their related empirical studies as well as reflections on potential research gaps that these studies have introduced are presented in Section 5.

It is important to repeat that an acceleration in the development of new EdTech projects has been reported in Kenya, especially in the last 5 years ([↑Otieno & Taddese, 2020](#)). As this section focuses on presenting EdTech research projects, it was considered relevant to introduce other EdTech projects that were not evaluated by empirical studies or evaluation research, these are presented in Annex A in Section 9.1.

### **4.2.1. Tusome Programme**

<https://www.rti.org/impact/tusome-early-grade-reading-activity>

Tusome, which translates to ‘Let’s Read’ in Kiswahili, is a programme focused on enhancing Kenyan early grade literacy quality. It aims to strengthen early grade literacy practices in grades 1, 2 and 3 in all 23,000 Kenyan public schools by:

- Providing paper-based educational materials and textbooks;
- Training all grades 1–3 teachers in the new early grade literacy approaches;
- Training Civil Society Organisation (CSOs) in new approaches to enable them to support teachers;
- Training senior leaders to use Tusome data to identify and address education system gaps (([U.S. Embassy in Kenya, 2016](#); [Kaye, 2020](#)))

EdTech is applied in Tusome to support teacher coaching and oversight. All CSOs receive tablets to capture classroom observations and to collect data. The findings of the evaluation of *Tusome* ([Piper, et al., 2017](#); [Kaye, 2020](#)) are explored further in Section 5 (see Section 5.2 and Section 5.3).

### 4.1.2. TESSA MOOCs

<http://www.tessafrica.net/home>

TESSA (Teacher Education in Sub-Saharan Africa) is a network of teachers and teacher educators that intends to create and implement initiatives targeted at improving classroom teaching practices in various African countries. TESSA MOOC is an initiative for capacity building that is based on facilitating online courses on TPD for Kenyan teachers and teacher educators. This initiative and overall approach were evaluated by [Wambugu \(2018\)](#) and the findings of this evaluation are presented in Section 5.2.

### 4.1.3. JiFUNzeni

*JiFUNzeni* means ‘inviting all to learn’ in Kiswahili and is an approach targeted at providing TPD opportunities that was developed by researchers at the Aga Khan University. This approach is implemented through providing training to different stakeholders, which are targeted at enabling them to create learning material for teachers in a given context, choosing appropriate technologies for teacher development while building content repositories. This approach was applied and evaluated by [Onguko \(2014\)](#) and involved 36 teachers using the tools created in two different regions, namely in rural western Kenya and in Nairobi (in Korogocho) (see Section 5.2)

#### 4.1.4. Digital Literacy Programme

<http://icta.go.ke/digischool/>

The Digital Literacy Programme is a programme that emerged from the Government of Kenya's vision to make sure every child is "prepared for today's digital world, and to transform learning in Kenya into a 21st century education system" (citation extracted from the web page listed above). The Digital Literacy Programme (DLP) delivers laptops and tablet devices pre-loaded with interactive digital content in Math, English, Science and Kiswahili, to primary school teachers and pupils to enhance their classroom activities. This programme was discussed by [↑Piper, et al.\(2017\)](#) and [↑Kaye \(2020\)](#) and is further illustrated in Section 5.3

#### 4.1.5. Uwezo

<https://www.uwezo.net>

Uwezo means 'capability' in Kiswahili. Uwezo is a five year initiative that started in 2010 that aimed to improve competencies in literacy and numeracy among children aged 6-16 years old in Kenya, Tanzania and Uganda. It is based on using an EdTech to contribute to a 10% increase in basic literacy and numeracy competencies for children in Kenya. This initiative was evaluated by the study of [↑Koomar & Blest \(2020\)](#) and is presented in Section 5.3.

#### 4.1.6. Worldreader

<http://www.worldreader.org/>

Worldreader works with partners to enable children in underserved communities and from marginalised backgrounds to access digital books. Worldreader supports reading programs in the United States, East Africa, West Africa, India, Latin America, and the Middle East and North Africa. Worldreader works in dozens of schools and libraries across East Africa, and millions of readers access their library via their mobile phones in this region. One of their projects, titled 'LEAP' brought digital reading to all 61 public libraries in Kenya.

#### 4.1.7 Instant Network schools

<https://www.un.org/partnerships/content/instant-network-schools-programme-united-nations-high-commissioner-refugees-unhcr-and>

Instant Network Schools was set up in 2013 by Vodafone Foundation, UNHCR and the UN Refugee Agency to give young refugees, host communities and their teachers access to digital learning content and the internet, improving the quality of education in some of the most marginalised communities in Africa. There are 36 Instant Network Schools currently operating across eight refugee camps in Kenya, Tanzania, the Democratic Republic of Congo and South Sudan. They have been working in 20 schools in Kenya, as of June 2021. This initiative is further presented the study of [Joynes & James \(2018\)](#) and further discussed in Section 5.4.

### **4.3. Academic institutions, research centres, and independent organisations working in education and EdTech**

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This section introduces an overview of some of the academic institutions, research centres and independent organisations that prominently appeared in the authorship of the articles and papers selected for this review. The search illustrated that academic institutions, national as well as international, are the main source of EdTech research funding for Kenya and contribute to more than 70% of the literature funding sources. Kenyatta University is one of the most prolific research institutions in the EdTech space in Kenya and has produced over a quarter of the publications found (see RLI- accessible [here](#)). This is followed by Moi University, EdTech Hub, Mount Kenya University and RTI international. Other institutions are the Aga Khan University, Masai Mara University and University of Nairobi.

#### **4.3.1. Kenyatta University**

<http://www.ku.ac.ke>

Kenyatta University is a public research university and its main campus is in Nairobi County. This university has an 'Educational Communication and Technology' department that was established in 1986. This department has been acting as a leading entity in EdTech research in Kenya, some publications emerging from this department include the research of [Miima et al., 2013](#), [Amuko et al., 2015](#) and [Ngatia, 2015](#) (these will be discussed in Section 5.2 and 5.3).

#### **4.3.2. Moi University**

<https://mu.ac.ke>



Moi University is a public university located in Kesses, Uasin Gishu county, in the former Rift Valley Province of Kenya. Moi University recently launched an education technology research programme and is now the university with the second highest number of EdTech publications in Kenya (after Kenyatta University), examples of such publications include the ones authored by [↑Mwei et al., 2011](#), [↑Tonui et al., 2018](#), and [↑Akinyi, 2015](#)).

### 4.3.3. RTI international

<https://www.rti.org>

Research Triangle Institute, trading as RTI International, is a nonprofit organisation headquartered in the Research Triangle Park in North Carolina. RTI provides research and technical services to address various global issues with science-based solutions and research. RTI International has worked with educational programmes/reforms in Kenya for nearly 40 years and one of the prominent Kenya-based academics emerging from the co-authorship network is affiliated to RTI (Benjamin Piper - see Section 4.1.1). RTI developed a mobile assessment and coaching tool called *Tangerine*, which is an EdTech software application that can be used for offline data collection on low-cost Android tablets. *Tangerine*, and its use during the *Tusome* programme, is discussed in Section 5.3.

### 4.3.4. Education Development Trust

<https://www.educationdevelopmenttrust.com/>

Education Development Trust works collaboratively with national and local governments, schools and other stakeholders to design and deliver solutions to improve education, in Kenya and globally. Their work is evidence-informed and they invest annually in various programmes of educational research. The Education Development Trust created the [Wasichana Wetu Wafaulu](#) (WWW) programme in Kenya, which is part of the UK-funded worldwide [Girls' Education Challenge \(GEC\)](#). WWW is a six-year programme that is aimed at supporting a cohort of about 72,000 girls complete their current phase of education and achieve improved learning outcomes.

## 5. Summary of the evidence on EdTech

The purpose of this section is to provide an overview of existing evidence and to highlight potential opportunities for future research. Drawing on the RLI framework discussed in Section 3 (accessible [here](#)), the literature is

thematically analysed and organised into five research topics of interest to EdTech Hub:

1. Technology to support personalised learning and teaching at the level of the student;
2. (In-service) teacher professional development, structured pedagogy, and technology;
3. Technology to advance data-use and decision-making in education;
4. Technology to promote access and participation in school;
5. Girls' education and technology.

The reported synthesis is intentionally — and necessarily (given the constraints of the scoping review methodology) — based on introducing research, and prioritising empirical studies, without discussing them into high levels of details. It intends to provide an accessible summary of existing evidence to inform educators, policymakers, and donors. Bibliographic details of all included studies and detailed coding of these studies can be found [here](#).

## **5.1. Technology to support personalised learning and teaching at the level of the student**

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Research suggests that using technology to support personalised learning can be effective in increasing learner access to education, enabling targeted instruction by students' learning level, and reducing the negative effects of high teacher–learner ratios ([↑Major & Francis, 2020](#)). As in many LMIC settings, however, in Kenya there is currently a lack of rigorous evidence for how technology can be used most effectively to personalise learning to the right level in an effective, cost-effective, and contextually appropriate way.

The search revealed 14 papers that mention personalised learning ([↑Redempta, 2012](#); [↑Obonyo, 2013](#); [↑Rugut & Role, 2013](#); [↑Kirimi, 2013](#); [↑Jobe, 2013](#); [↑Kaindio & Wagithunu, 2014](#); [↑Kisirkoi, 2015](#); [↑Pedersen, 2015](#); [↑Ndaiga & Salim, 2015](#); [↑Kingori, 2018](#); [↑Araka et al., 2019](#); [↑Heinrich et al., 2020](#); [↑Ng'ang'a et al., 2020](#); [↑Ngari & Ndung'u, 2020](#)). The vast majority of the papers (n=12) mention that technology has potential to support personalised learning and, in turn, to improve learning outcomes. However, only one paper in the search provides a study where technology is applied for personalised learning, noting that the proposed intervention was only partially evaluated ([↑Heinrich et al., 2020](#)). This empirical study explored how technology supporting personalised learning was used in North Kamagambo primary schools. The study was based on offering tablets with literacy applications that invited children to read at their

own pace and to address their individual learning needs by accessing features enabling them to adjust the font size and look up words that they did not understand ([Ibid](#)). The authors concluded that the role of technology for personalised learning needed to be evaluated by considering local infrastructures and potential barriers in accessing technology, pointing out that a one-to-one tablet to student ratio was only observed for 32% of children in their study. They concluded saying that this limited “the ability of students to take full advantage of features that facilitated personalised learning” ([Ibid](#), p.23).

Although only briefly mentioned in the study of [Heinrich et al., 2020](#), the costs of technology to support personalised learning need to be acknowledged in this scoping review. Some of these costs might be related to the number of devices needed for such EdTech interventions but they could also be associated with the technical complexities and hardware expenses often needed to design technology-supported personalised learning tools. This was briefly discussed in a study that proposed a model for measuring and supporting self-directed learning opportunities in Kenya ([Araka et al., 2019](#)). The authors presented some challenges and required investments to implement and design technology-supported personalised learning interventions, mentioning that “offering individualized support and guidance may not easily be achieved because of large numbers of students enrolling on e-learning” [Araka et al., 2019](#), p.2. To use technology to support personalised learning in a sustainable way, and especially in low-resource contexts, a range of challenges need to be addressed, such as resource constraints, lack of technical expertise and infrastructure. These are challenges that continue to emerge in research exploring the role technology-supported personalised learning in LMICs ([Kaye & Ehren, 2021](#)).

The search also reveals two papers introducing specific opportunities and needs related to personalised learning in Kenya. In an exploratory study intending to provide recommendations related to improving EdTech interventions by considering personalised learning features, the authors reported that translation features had significant potential to enable more children to access and benefit from EdTech in Kenya. They argued that using exclusively English in EdTech could imply that many children would be unable to comprehend the educational content of EdTech interventions ([Ngari & Ndung'u, 2020](#), p.89). The authors also mentioned the potential of self-paced learning features could also be used to improve learning outcomes for children ([Ibid](#), p.89). In the search, another exploratory study on personalised learning was found. This study is based on illustrating the challenges secondary schools in Kenya face when using EdTech and also called for more personalised learning features to adapt to local languages' needs ([Kirimi, 2014](#)). Despite

limited evidence and empirical studies on the use of EdTech to support personalised learning in Kenya, the search revealed two papers illustrating potential needs to use personalised learning to improve educational outcomes in Kenya, these are to use personalised learning to align EdTech interventions to varying language and self-paced learning needs.

Overall, there is currently a lack of rigorous evidence and empirical studies exploring how technology can be used most effectively to personalise learning in an effective, cost-effective, and contextually appropriate way in Kenya. The limited evidence found in the search illustrates a gap to further examine how to effectively use technology-support personalised learning to improve learning outcomes in Kenya. The role of teachers and parents in shaping technology-enabled personalised learning effectively is also an area where additional research is needed. This is in addition to research needed to explore whether (and if so, how) personalised approaches that feature technology adapting or adjusting to learners' individual needs are effective in leading to better learning outcomes.

## **5.2. Teacher professional development, structured pedagogy, and technology**

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In total, 35 papers within the literature review were categorised within the teachers theme. Research on teachers professional development (TPD), and integration of technology into classrooms/pedagogies, is mainly focused on the following areas in Kenya: Technology modalities and blended approaches to teacher development (n=8), Using technology to develop and support facilitators and coaches (n=4) and Teachers technology adoption (n= 16). Note, these categories are not mutually exclusive and in some cases included articles related to one or more of these areas (for instance, many examine both teachers' needs and technology adoption and are considered together).

### **5.2.1. Technology modalities and blended approaches to teacher development**

The search revealed 6 papers ([↑Kaindio & Wagithunu, 2014](#); [↑Amuko, et al., 2015](#); [↑Gitome, 2015](#); [↑Radhakrishnan, et al., 2018](#); [↑Wambugu, 2018](#), [↑Bett & Makewa, 2020](#)) that discussed technology modalities for teacher development and 2 papers exploring blended approaches for teacher professional development ([↑Onguko \(2014](#); [↑Hooker, 2017](#)).

Two empirical studies were found on the topic of technology modalities for teacher development: one evaluated the use of Massive Online Open Courses (MOOCs) for TPD and the other one discussed TPD delivered through online

support groups ([↑Wambugu, 2018](#); [↑Bett & Makewa, 2020](#)). The following paragraph introduces these two studies.

TESSA (Teacher Education in Sub-Saharan Africa) MOOC is an initiative based on facilitating online courses for Kenyan teachers and teacher educators. [↑Wambugu, 2018](#)'s study was based on evaluating teachers' experiences (n=93) and presented findings targeted at informing and improving interventions using MOOCs for TPD. These findings illustrated the importance of facilitating interactive activities among teachers, allowing self-regulated scheduling, presenting practical educational content and awarding certificates at the end of TPD-related MOOCs. The authors concluded their study saying that "MOOCs represent an untapped potential for teacher professional development that can be a cost and resource effective means to deliver quality education to teachers and teacher educators." ([↑Wambugu, 2018](#), p.1). The second study involved teachers (n=1100 teachers) and aimed to explore the use and impact of teacher-led online forums groups on Facebook for TPD ([↑Bett & Makewa, 2020](#)). It revealed that teacher-led groups on Facebook were suitable to facilitate TPD opportunities as they enabled teachers to start conversations, ask questions and/or share resources ([↑Bett & Makewa, 2020](#)). The authors concluded saying that "The temptation, especially by government educational agencies, is to create a formal online platform where teachers can grow and interact professionally. While such a move is laudable and bound to work, it is important to understand the characteristics of informal teacher-led online forums, which may not apply to formally organised ones" ([↑Bett & Makewa, 2020](#), p.12).

The evidence landscape on blended approaches to teacher development in Kenya is nascent, in total two studies discussing this theme were found in the search ([↑Onguko, 2014](#); [↑Jukes et al., 2017](#)). These are presented in the following paragraph.

The study of [↑Jukes, et al. \(2017\)](#) was presented as an initiative aiming at using TPD to improve children's literacy outcomes in Kwale county. This study was based on training workshops, lesson plans and weekly text-messages for teachers and was evaluated in 101 schools. Text messages were used to enable teachers to access instructional support. Teachers were given the opportunity to reply to messages with weekly phone credit, the authors reported that "The response rate to text messages was high (an average of 87%) and teachers told us that they valued the support provided by these messages. They were successful in creating a sense of community, making teachers feel valued and listened to, and being an important mechanism for feedback and improvement of the intervention" ([↑Jukes, et al., 2017](#), p.27). The other study related to this topic was carried out by [↑Onguko \(2014\)](#) and presented a

blended approach to teacher development called *JiFUNzeni* (JiFUNzeni means inviting all to learn in Kiswahili). The *JiFUNzeni* approach is based on training regional educators to create blended learning courses, choosing appropriate technologies in a given context while building content repositories for TPD. This approach was evaluated (n=36 teachers) in two different regions, namely in rural western Kenya and in Nairobi (in Korogocho). Lessons from the implementation of *JiFUNzeni* approach reinforced the importance of considering contextual realities in implementing teachers' professional development through blended learning approaches as well as variations related to infrastructural and teachers' professional development needs in different contexts. In this study, the teachers in rural western Kenya needed to learn about suitable practices to teach in large class sizes while teachers in Korogocho needed professional development opportunities targeted at improving assessment processes.

To summarise, examples of solutions using technology for TPD were presented, and preliminary indications on the suitability of teacher-led online platforms and MOOCs for TPD were reported. Future research could build on these studies to analyse the impact of technology-supported TPD interventions on teachers' development/learning and classroom practices. Following this, little research was found on blended learning approaches to teacher development and only one study ([↑Onguko \(2014\)](#)) integrated local and contextual factors in the design of the proposed TPD intervention. This suggests that research considering and implementing contextual variation and local needs in technology-supported TPD is currently a literature gap. Future research could be conducted by collecting and analysing data throughout technology-supported/blended TPD interventions to assess the needs and requirements that teachers have in different contexts where they operate. This could lead to presenting evidence related to designing technology-supported TPD interventions that are contextually appropriate and responsive to well-defined and existing needs.

### **5.2.2. Using technology to develop and support facilitators and coaches**

In total, four papers discussing the inclusion of facilitators and coaches in relation to technology-supported TPD interventions were found in the search ([↑Piper, et al., 2017](#); [↑Radhakrishnan, et al., 2018](#); [↑Piper et al., 2018](#), [↑Kaye, 2020](#)). All of these papers discussed the *Tusome* programme, which focused on improving the level of Kenyan children's early grade literacy. This programme was mainly targeted at improving teacher quality and leveraged technology to improve children's literacy learning outcomes (more details about this programme were presented in Section 4.2.1). *Tusome* is lauded as a successful

intervention relying on using EdTech to develop and support teachers and coaches, as it significantly improved national learning outcomes related to children's literacy, and the use of tablets positively impacted teacher behaviours ([↑Kaye, 2020](#)). Some of the factors that contributed to these outcomes were reported in a study conducted by [↑Kaye\(2020\)](#), some of which are summarised below:

- The *Tusome* programme facilitated training on literacy pedagogies to both teachers and coaches, targeted at collaboratively improving teaching practice.
- The programme also introduced clear roles and responsibilities within this programme for teachers and coaches.
- Fostering trust among teachers and coaches was a key success factor. *Tusome* achieved this through clear, transparent communication.
- Training to enable coaches to use tablets was part of this programme. The tablets were introduced as devices to promote transparency and accountability, encourage constructive feedback and share responsibility.
- The tablets were used as a tool to support a very specific aspect of teacher coaching.

This programme was implemented with the intention to tackle what was described by [↑Piper, et al.\(2017\)](#) as “the most prevalent educational problem in Kenya” (p.75), which is attributed to poor instructional quality. The tablets were provided with tools targeted at supporting coaches to gather observation data during school-based inspections and to provide instructional improvement support to teachers, which in turn intended to lead to improved accountability structures in Kenya's education system. The evaluation of this programme, mostly targeted at exploring its effectiveness to collect classroom observations and to improve children's learning outcomes, showed results illustrating high levels of tablet use, increased accountability, and improved children's learning outcomes. “The consistent increases over time in the numbers of classroom observations undertaken by coaches suggest that the accountability system is functional, and that the coaches see the classroom observation tasks as important.” (P.72). This evaluation also concluded that it is necessary to apply EdTech to a “specific instructional challenge in order to see positive results.” ([↑Piper, et al., 2017, p.74](#)).

Overall, the presented studies illustrated that the *Tusome* programme focused on building the capacity of its teachers and coaches, leveraging the use of tablets only in so far as it supports this goal. Clear communication and a common strategy, shared among different involved stakeholders, allowed the programme to establish trust among internal and external stakeholders alike. Potential future work related to the inclusion of facilitators and coaches in

relation to technology-supported TPD initiatives was described in the concluding section of the analysis provided by [↑Piper et al., 2018](#). After arguing that the *Tusome* programme could be illustrated as a programme that facilitated basic inputs for teachers to access pertinent TPD opportunities and for children to access educational resources, the authors said that “The bigger challenge for the education system going forward is developing the capacity to ensure ongoing support of the type that enables teachers and students to make good day-to-day use of those basic inputs.” (p.317).

### 5.2.3. Teachers’ technology adoption

Lack of ICT knowledge and unsuitable network infrastructure are some of the most prominent teacher needs and barriers in enabling teachers to adopt technology in classrooms and pedagogies found in the search. In total 16 studies exploring the topic of teachers’ technology adoption were found ([↑Kiptalam & Rodrigues, 2010](#); [↑Ogembo, et al., 2012](#); [↑Miima, et al., 2013](#); [↑Mulwa & Kyalo, 2013](#); [↑Mbogo, et al., 2014](#); [↑Kaindio & Wagithunu, 2014](#); [↑Gitome, 2015](#); [↑Amuko, et al., 2015](#); [↑Chemwei, et al., 2016](#); [↑Jukes, et al., 2017](#); [↑Hooker, 2017](#); [↑Mwanda et al., 2017](#); [↑Kaume-Mwinzi, 2018](#); [↑Ochieng & Miima, 2019](#); [↑Muinde & Mbataru, 2019](#); [↑Bett & Makewa, 2020](#)). The following paragraphs will highlight some of these studies, prioritising the ones that presented empirical findings.

Out of these 16 papers, 6 of these included studies targeted at collecting data on teachers’ attitudes and perceptions related to EdTech use. Teachers’ perceptions are described as a factor that can influence technology adoption in and outside of classrooms, as negative perceptions toward technology can discourage teachers from putting EdTech into use. In total five studies (n=5) presented results illustrating positive teachers’ perceptions related to the potential of EdTech to improve children’s learning outcomes in Kenya ( [↑Miima, et al., 2013](#); [↑Mulwa & Kyalo, 2013](#); [↑Mbogo, et al., 2014](#); [↑Ochieng & Miima, 2019](#); [↑Muinde & Mbataru, 2019](#)) and divergent results illustrating negative perceptions were found in one study ([↑Hooker, 2017](#)). Additional findings related to teachers’ perceptions were found in some of these studies. [↑Mbogo, et al. \(2014\)](#) presented results illustrating that teachers and administrators in various counties (n=30 teachers and n=31 administrators) perceived issues related to school administration and management as having the most potential to be improved with the use of technology. [↑Miima, et al.\(2013\)](#) presented evidence reinforcing that perceptions should only be presented as a factor that influences EdTech implementation and use. Their study presented findings illustrating that the majority of teachers interviewed (n=45 teachers) had positive perceptions of EdTech use but were unwilling to implement technology in their classrooms due to challenges related to lack of skills and confidence using technology, reticence related to spending time



understanding softwares and lack of knowledge to integrate EdTech into their classrooms.

The need for in-service TPD of ICT skills was also revealed in the search. In total 12 papers illustrated the need of TPD training to support teachers integrating EdTech into pedagogies and in their classrooms were found ([↑Kiptalam & Rodrigues, 2010](#); [↑Ogembo, et al., 2012](#) [↑Mulwa & Kyalo, 2013](#); [↑Kaindio & Wagithunu, 2014](#); [↑Mbogo, et al., 2014](#); [↑Amuko, et al., 2015](#); [↑Chemwei, et al., 2016](#), [↑Mwanda et al., 2017](#); [↑Kaume-Mwinzi, 2018](#); [↑Nyaga, 2018](#); [↑Muinde & Mbataru, 2019](#)). The majority of these papers (n=9) argued that governmental and political priorities should involve, and allocate resources, to the implementation of training to support teachers acquiring ICT and digital literacy skills as part of TPD curriculums. For example, a study including teachers (n=89) randomly selected from a total of 468 teachers in Kenyan secondary schools in various counties illustrated that most teachers who were required to implement EdTech in their classrooms had low levels of digital literacy and had not received any training related to using digital devices in classrooms ([↑Kiptalam & Rodrigues, 2010](#)). Aligned with these findings, research involving teachers (n=169) in six primary schools in different regions in Kenya presented findings related to the use of computers in classrooms. The results suggested that most teachers were lacking skills to use computers in their classrooms, leading them not to use them as part of their teaching practices. The authors recommended facilitating ICT and digital literacy training for future teachers as part of university and governmental curriculums ([↑Chemwei, et al., 2016](#)). Another study carried out in twelve public schools in Nairobi presented evidence on the lack of resources allocated to TPD for improving digital skills that would enable teachers to use EdTech in classrooms and schools. This study also presented insights on the benefits of allocating resources to facilitate formal in-service TPD of ICT skills, by presenting results pointing to poor outcomes when informal training or self-training were encouraged ([↑Amuko, et al., 2015](#)).

The Digital Literacy Programme is another case study that illustrates how teachers' perceptions and capacity development, among other factors, can influence the outcomes of an EdTech intervention. The Digital Literacy Programme (DLP) was announced in 2013 and aimed to enable all Kenyan school-children to access laptop computers (see Section 4.1.4). This programme went through a process of iterations, which progressively narrowed down its scope and led teachers to grow negative perceptions toward this programme over time ([↑Kaye, 2020](#)). In May 2016, the government advised that the DLP would provide all grade 1 students in Kenya with tablets and all teachers with laptops ([↑Kaye, 2020](#) citing [↑Wanzala & Nyamai, 2018](#)). The

programme's implementation began in 2016 and delivered significant achievements within 6 months, including training approximately 70,000 teachers by mid-2016, creating online content for grades 1 and 2 (in Kiswahili, English, mathematics, science and social studies) and providing electricity to all but 500 schools in Kenya ([↑Mariga et al., 2017](#), [↑Kaye, 2020](#)). However, various challenges limiting the realisation of the programme's intended outcomes started to emerge shortly after this. It was reported that, even two years later, in July 2018 only 19,000 of the 23,000 schools had received devices ([↑Kaye, 2020](#) citing [↑Wanzala & Nyamai, 2018](#)). Enabling teachers to use the new device acquired was also problematic as only 70,000 teachers (out of approximately 250,000) accessed professional development training by the end of 2017. It was later found that approximately a third of teachers involved in this programme were not using the tablets in their classrooms despite having received them, leading [↑Kaye \(2020\)](#) and [↑Nyaga \(2018\)](#) to argue that the lack of capacity development combined with teachers' negative perceptions of the programme contributed to this limited uptake. [↑Kaye \(2020\)](#) added on this saying that "The DLP provides an excellent example of the importance of considering trust, capacity and accountability when designing and implementing EdTech interventions. Overlooking these elements played a large part in the eventual failure of the DLP." ([↑Kaye 2020](#), p.193).

In total 6 studies focusing on analysing teachers' attitudes and perceptions of EdTech use were found, which suggests that teachers' attitudes and perceptions are considered important factors to influence the implementation of EdTech interventions in Kenya. Following this, a clear convergence was found in the papers reviewed, which pointed at the urgency of shaping governmental and political priorities to support teachers to acquire ICT and digital literacy skills as part of TPD curriculums. The ongoing, continuous nature of professional development to support teachers' sustained adoption and effective use of EdTech by teachers also received little attention in the studies found. This is considered important for future research and EdTech decision-making, as illustrating the ongoing and continuous nature of TPD could contribute to gradually improving teaching practices and creating sustainable impact. Overall, evidence related to shaping TPD opportunities to enable Kenyan teachers to efficiently use digital technologies in the classroom seem limited. This could be explored by integrating key characteristics of effective teacher learning and digital literacy, such as peer learning, encouraging the practical application of teaching methods and gaining confidence with digital devices.

## 5.3. Technology to advance data-use and decision-making in education

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Technology could enhance the quality of education by using it for the purpose of informing decision-making as well as the collection and analysis of data. However, many LMICs lack the technology-enabled mechanisms and resources to collect and analyse such data, let alone use it to make informed decisions about education policy and systems.

The search contained 22 papers that discussed technology to advance the use of data and decision-making in education. The literature falls within four main categories: Accountability (n=4); Role of handheld devices for data collection and analysis (n=6); Technology to measure the performance of learners (n=4); Policy planning and systems strengthening (n=8). These categories are not mutually exclusive and in some cases, papers cover one or more of these categories.

### 5.3.1. Accountability

The search revealed four papers that discuss the theme of data and technology to encourage accountability ([↑Koomar & Blest, 2020](#); [↑Ngari & Ndung'u, 2020](#); [↑Rodriguez-Segura, 2020](#); [↑Kaye, 2021](#)). Technology to encourage government accountability is touched upon in a literature review that assesses how prepared the Kenyan education system was to overcome challenges caused by Covid-19 ([↑Ngari & Ndung'u, 2020](#)). The authors argued that the National Education Management Information System (NEMIS), which is the Kenyan Ministry of Education's (MoE) data management system, should further solidify and support effective collection and use of data for educational accountability ([↑Ngari & Ndung'u, 2020](#), p.93). The use of data for accountability in Kenya is also discussed in a paper that explores the use of EdTech for data monitoring, including the use of technology to encourage parental accountability ([↑Koomar & Blest, 2020](#)). The authors refer to *Uwezo*, a five year programme starting in 2010 that was implemented by a non-profit local organisation of the same name, which aims to improve the literacy and numeracy of children ranging from six to sixteen years of age in Kenya, Tanzania and Uganda. The programme captured data related to children's literacy and numeracy in the hope that this information would be used as part of advocacy and/or communication strategies to "encourage parents' advocacy for better education services and...incentivise governments to focus on learning outcomes and improve education quality" ([↑Koomar & Blest, 2020](#), p.11). Technology to encourage parental accountability is also discussed in an exploratory analysis of technology use in developing countries

(↑[Rodriguez-Segura, 2020](#)). The author refers to a mobile money platform active in Kenya (no name is given) which could lock the savings accounts of parents who were imminently due to pay educational fees for their children (↑[Rodriguez-Segura, 2020](#), p.22). Although not empirically measured in the paper, it appears that the platform prevented parents from spending money that could jeopardise their ability to pay for their children's education.

A critical challenge to the use of data for accountability processes in Kenya is related to the autonomy of various bodies that are part of the public education system. For example, the Teachers Service Commission (TSC) is the national agency responsible for teacher management processes and accountability in Kenya. According to ↑[Kaye \(2021\)](#), the TSC's growing independence from the Ministry of Education (MoE) has contributed to creating additional challenges related to collecting education-related governance and accountability data in Kenya (↑[Kaye, 2021](#), p.186). *Tusome* is presented as a programme that delivered a culture of supportive development, coordination and trust between various national stakeholders. For example, the teachers and the Curriculum Support Officers (CSOs) involved in this programme were given clear roles and responsibilities in addition to shared and collaborative objectives (e.g. to use technology to support teachers in a non-punitive manner). According to Kaye, this and other measures implemented in *Tusome*, created "a feeling of collaborative accountability for children's learning" (↑[Kaye, 2021](#), p.195).

This section illustrates that additional evidence and best practices related to using data to encourage and/or increase accountability throughout EdTech decision-making processes in Kenya are needed. The studies introduced in this subsection suggest that it could be relevant to conduct empirical research into how effective, and why, *Uwezo* and the mobile money platform presented above (and potentially other/upcoming interventions), were in encouraging greater governmental, teachers and/or parental accountability in Kenya. In addition, in light of *Tusome's* success, it could also be beneficial for the MoE to explore ways to collaborate with the TSC and other autonomous education bodies in order to incentivise teachers, and potentially other stakeholders, to explore how to efficiently collect data that could be used for accountability and to measure learning outcomes in Kenya.

### **5.3.2. Role of handheld devices for data collection and analysis**

The literature search reveals that certain handheld devices could play a positive role in the collection and analysis of data for education in Kenya. The role of handheld devices in data collection and analysis is discussed in six papers (↑[Haßler et al., 2020](#); ↑[Kaye, 2021](#); ↑[Koomar & Blest, 2020](#); ↑[Heavner et al.,](#)

2017; ↑[Mayeku et al., 2010](#); ↑[Piper et al., 2015](#)). *Tusome* is referenced and discussed in three of the papers (↑[Haßler et al., 2020](#); ↑[Kaye, 2021](#); ↑[Koomar & Blest, 2020](#)). *Tusome* involves various strands of activity related to using handheld devices for data collection and analysis (also discussed in Section 5.2), including supporting CSOs to use tablets to capture school-level data as well as the implementation of mechanisms to analyse data to illustrate regional and national challenges. According to ↑[Kaye \(2020\)](#) the use of tablets as well as fostering trust among teachers and the CSOs were two of the factors that made data “more accessible and transparent” (↑[Kaye, 2020](#), p.196). Tablet use was introduced alongside pedagogical and technology training opportunities, which were also illustrated as factors that contributed toward enabling the CSOs to collect quality data (↑[Kaye, 2020](#)).

Besides *Tusome*, *Sauti za Wananchi* is another example that presented insights on how handheld devices could be used for processes of data collection. *Sauti za Wananchi* is an interactive mobile phone survey that gathers citizens’ opinions on a wide range of issues, including education (↑[Koomar & Blest, 2020](#)). The collected data can also be viewed on an online public platform that aims to present data that could be used to inform citizens and policymakers. It is important to note that initiatives like *Sauti za Wananchi*, that depend upon the use of certain handheld devices and data connections, run the risk of exacerbating inequalities in low-resource environments. This was reported by ↑[Koomar & Blest \(2020\)](#) who mentioned that people without mobile phones and certain mobile network coverage were excluded from participating in this initiative. When designing programmes that rely on the use of certain handheld devices, consideration should be given as to whether potential users have access to the infrastructure and resources necessary for participation, such as mobile phone handsets, mobile phone coverage and data packages. If such infrastructure and resources are not available, project implementers could be required to explore additional or alternative measures to access such groups.

### **5.3.3. Technology to measure the performance of learners**

The search contains four papers that discuss the role or potential of technology to measure the performance of learners (↑[Akinyi, 2015](#); ↑[Koomar & Blest, 2020](#); ↑[Ndaiga & Salim, 2015](#); ↑[Piper et al., 2016](#)). The search presents two programmes using technology to measure the performance of learners - *Uwezo* and *Tusome* (↑[Koomar & Blest, 2020](#)). *Uwezo*, which was discussed previously, used household surveys to conduct annual assessments of children’s literacy and numeracy levels. The other example is *Tusome*, which has been discussed at length in other sections of this scoping review. Both ↑[Koomar & Blest \(2020\)](#)

and [↑Piper et al. \(2016\)](#) discuss *Tangerine™*, which is an open-source early learning assessment software developed by RTI International (see section 4.3.5) which is used to collect data on learner performance that was used as part of *Tusome*. [↑Piper et al. \(2016\)](#) argued that *Tangerine™* facilitated a highly accurate measurement of student performance, for instance due to the fact that the software presented features related to collecting targeted and individual data by adapting to the children's divergent learning tasks and progress ([↑Piper et al., 2016](#), p.208)

*Uwezo* and *Tusome's* presentation as the only two examples of programmes using data-driven technologies to measure the performance of learners suggests that the use of technology in this respect is not widespread, a point that was also argued by [↑Ndaiga & Salim \(2015\)](#). Given the increasing global and increasing use of *Tangerine™*, it could be relevant for policy makers, researchers and programme implementers to consider what are the needed software features, and factors to contextualise technology use, to support collecting and analysing data to measure, and improve, learning outcomes and performances.

### **5.3.4. Policy planning and education systems strengthening**

Eight papers discussing the role of technology in policy planning and the strengthening of education systems emerged from the search ([↑Kipsoi et al., 2012](#); [↑Piper et al., 2015](#); [↑Wambugu et al., 2017](#); [↑Koomar & Blest, 2020](#); [↑Langthaler & Bazafkan, 2020](#); [↑Miller, 2020](#); [↑Mbogo, 2020](#); [↑Kaye, 2021](#)). These papers seem to all be acknowledging that technology could play a positive role in policy planning and the strengthening of Kenya's education system. For example, the authors of an exploratory analysis of the barriers that hinder technology integration in education management in Kenya state that by collecting data with technology "administrators and policy makers can construct virtual scenarios around different policy options to determine needs and analyse potential consequences" ([↑Kipsoi et al., 2012](#), p.22).

All these eight papers also mention that there is limited evidence related to the use of technology to improve policy planning and strengthen education systems. [↑Piper et al. \(2015\)](#), for example, argued that more research and evidence is needed, especially related to cost-effectiveness measures, to enable policy makers to use data to make informed system-level decisions related to EdTech. Two papers present indications related to technology playing a positive role in policy planning and the strengthening of Kenya's education system ([↑Koomar & Blest, 2020](#); [↑Kaye, 2021](#)). [↑Kaye \(2021\)](#) mentions an online dashboard created as part of *Tusome* which provides data for

evidence-based policymaking, stating that “The data identified strengths and weaknesses which informed...system-level policy dialogue” ([↑Kaye, 2021](#), p.195). [↑Koomar & Blest \(2020\)](#) also briefly mention that the data generated by *Sauti za Wananchi* could be used to support policy makers to identify educational needs.

In an exploratory study of digitalisation, education and skills development in Sub-Saharan Africa, [↑Langthaler & Bazafkan, \(2020\)](#) express concern (to education experts) about the rapid growth of private EdTech companies in the region. According to the authors, these private entities have the potential to, “dislocate educational data collection, storage and processing out of the realm of public policy for commercial exploitation” ([↑Langthaler & Bazafkan, 2020](#), p.14). This suggests that it could be relevant for the Kenyan government as well as for EdTech researchers and implementers to consider the long-term impact of the growing influence of private EdTech firms. In an environment such as Kenya where technology’s role in policy planning and the strengthening of the education system is relatively nascent, it could be relevant to give consideration to how private EdTech companies can be encouraged to collaborate and/or share the data they generate and harvest with EdTech researchers, implementers as well as with local, non-commercial, governmental agencies such as the MoE.

## 5.4. Technology to promote access and participation in school

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Technology has the potential to provide education access to children who are out of school and promote continuing education. It is also imperative to evaluate how EdTech can help to make up for the learning loss and potential school drop-outs caused by the Covid-19 pandemic, that may lead children not to go back to school even when schools reopen.

The research related to the use of technology for promoting participation in school in Kenya has focused on: girls and access (n=9), technology to motivate learners (n=8), EdTech for children with special educational needs and/or disabilities (SEND) (n=4), EdTech for refugees and displaced children (n=1) and Technology for out-of-school children (n=4). Girls and access is covered in the next section (Section 5.5.), therefore, this section will focus on technology to motivate learners, SEND and access, and use of technology for out-of-school children.

### 5.4.1. Technology to motivate learners

The literature presents significant agreements on the role and potential of technology to improve children's motivation to learn. All eight articles that discuss this theme reported that the use of technology in education positively impacts learners' willingness to learn, motivation and/or curiosity with the subject matter ([↑Wims & Lawler, 2007](#); [↑Ayere et al., 2010](#); [↑Odera, 2011](#); [↑Jesse, 2014](#); [↑Kisirkoi, 2015](#); [↑Amuko et al., 2015](#); [↑Chemwei et al., 2016](#); [↑Rugut & Role, 2013](#)). For example, an empirical study that used surveys with head teachers, English teachers and pupils in primary schools in Kisumu District and based on evaluating how radio can be harnessed in the teaching of English, reported that radio use was a factor that significantly contributed to children's motivation to learn English ([↑Odera, 2011](#)). According to the authors, the use of radio in English lessons, "stimulates thinking and imagination, because radio uses music and different sound effects to make learning enjoyable" ([↑Odera, 2011](#), p.965). Similar positive outcomes are reported for more high-tech devices. For example, an empirical case study of the integration of ICT in a boys' secondary school near Ngong town, Kajiado county found that the majority of surveyed teachers (n=30) reported that using computers in their classrooms "raised students enthusiasm, interest and creativity" ([↑Kisirkoi, 2015](#), p.1907). In addition, technology's potential to encourage learners retention in school is discussed in an empirical evaluation of the impact of ICT in Kenyan educational institutions in which the authors state that technology's potential to motivate learners, "may deter children from dropping out" ([↑Wims & Lawler, 2007](#), p.71).

In light of this emerging evidence related to using EdTech to motivate learners, it is advisable for policy-makers, researchers, implementers and teachers to build on these preliminary findings to further define if and how technology could be effectively harnessed to motivate out-of-school learners, improve their learning outcomes and to increase school (re-)enrollment. This is also illustrated as a research gap, where more research could create a significant impact in supporting and guiding strategies and programmes to enable children to go back and remain in schools in Kenya, especially after Covid-19.

### 5.4.2. EdTech for children with special educational needs and/or disabilities (SEND)

Technology has the potential to widen participation in education so that SEND learners benefit from more equitable learning outcomes and access to education. This idea is promoted by the vast majority of papers (n=4) that



discuss the theme of technology and access for SEND learners ([↑Kaindio & Wagithunu, 2014](#); [↑Piper et al., 2016](#); [↑Mwendwa, 2017](#); [↑Ngari & Ndung'u, 2020](#))

The authors of an empirical study about the integration of ICT skills in Kenyan pre-school education write that, “assistive/adaptive ICTs can reduce barriers to participation for children with special physical or learning needs” ([↑Kaindio & Wagithunu, 2014](#), p.91). This point is also made by the author of an empirical study about the availability of materials and facilities for EdTech integration within the public primary curriculum in Kitui County. The author states that EdTech could be used to enhance teaching opportunities and outcomes for learners with disabilities ([↑Mwendwa, 2017](#)).

Despite expressing the potential of EdTech for SEND learners, within the search, no applied or empirical studies of technology improving SEND learners' access to education could be found. In fact, the literature makes reference to technology not meeting this expectation, for example [↑Piper et al.\(2016\)](#) stated that, “Though ICT applications have the potential to be adaptive for students with visual, hearing, physical, or developmental disabilities...they have not typically been designed for such usage in interventions in sub-Saharan Africa” ([↑Piper et al., 2016](#), p.205). The literature suggests that the situation has not improved since 2016, with a paper pointing to the lack of SEND provision in digital content made available during Covid-19. According to this exploratory study looking into the Kenyan education sector's preparedness for the Covid-19 pandemic, within the schedule of educational television programmes aired during school lockdowns they found that “No single program is catering to special education. The ones for regular learning should have sign language interpreters at least to aid the deaf.” ([↑Ngari & Ndung'u, 2020](#), p.86). The literature emerging from the search demonstrates that in Kenya technology's potential to improve educational access and learning outcomes for children with SEND needs and to increase education access to SEND learners is only discussed and not yet empirically researched or evaluated.

### **5.4.3. EdTech for refugees and displaced children**

The research revealed one study exploring the use of EdTech for refugees and displaced children ([↑Joynes & James, 2018](#)). An exploratory study based on looking at how EdTech has been used to improve learning outcomes for refugees and Internally Displaced People refers to the *Instant Network Schools (INS)* programme ([↑Joynes & James, 2018](#)) (see Section 4.1.7.). The INS, which is implemented by UNHCR, UN Refugee Agency and Vodafone Foundation, proposed 'Instant Classrooms' to learners living in refugee camps in countries where Vodafone operates. Each Instant Classroom is equipped with a laptop, 25 tablets preloaded with educational software, a projector, a speaker and a hotspot modem with 3G connectivity. According to the authors, each Instant

Classroom can be set up in 20 minutes and they are designed to work in areas that lack electricity and internet connectivity ([↑Joynes & James, 2018](#)). An avenue for future research could be to explore the outcomes and impact of this programme and build on these findings to shape EdTech intervention to effectively improve learning outcomes for refugees and displaced groups in Kenya.

### 5.4.4. Technology for out-of-school children

The research revealed four papers that recognised the key role that technology can play in the education of out-of-school children ([↑Trucano, 2005](#); [↑Tonui et al., 2016](#); [↑Jordan & Mitchell, 2020](#); [Ng'ang'a et al., 2020](#)). According to an empirical study that proposes a model for the implementation of web-based learning in secondary education in Kenya, EdTech could be used to “reach students who are unable to attend classes in a classroom environment because of time or distance constraints” ([↑Ng'ang'a et al., 2020](#), p.24). This idea that technology opens education opportunities to children who are classed as out-of-school is also presented in an empirical study into teachers' perceptions of ICT as a tool for curriculum management. The authors refer to a paper authored by [↑Trucano \(2005\)](#) which asserts that “ICTs can be used to open educational opportunities to students and individuals who are strained from attending institutions of learning” ([↑Tonui et al., 2016](#), p.15). Within the search, another example of technology for out-of-school children was found, which is called *Eneza Education*. *Eneza Education* provides a mobile phone-based educational platform called *Shupavu291* ([↑Jordan & Mitchell, 2020](#)). *Shupavu291* is introduced as a programme intending to provide educational content through SMS to out-of-school children. However, no empirical study exploring its outcomes or impact on out-of-school children was revealed in the search, which presents an avenue for potential empirical research.

It is also important to consider that some Kenyan remote and/or marginalised communities do not have access to certain devices and/or to electricity, suggesting that for many of them technology remains a distant idea. According to [↑Haßler et al. \(2020\)](#) “Despite some initial optimism, emerging evidence from low-income countries indicates that few children are using EdTech to learn during the current pandemic” ([↑Haßler et al., 2020](#), p.6). The authors refer to only 22% of children in Kenya having access to digital learning materials during Covid-19. [↑Ngari & Ndung'u \(2020\)](#) presented additional discussions related to this topic by exploring the shortcomings of digital provision during Covid-19 in Kenya. Their study revealed shortcomings related to infrastructure to access technology and/or the internet as well as poor and unrealistic instructional design of digital materials. These findings and increasing evidence related to technology access emerging during Covid-19

could be used to further assess and find solutions related to enabling out-of-school children to access and benefit from EdTech. These, as seen above, could require further efforts in aligning EdTech interventions to local realities as well as improvements in infrastructures and instructional design of digital materials in Kenya. As suggested in this section, these interventions could involve exploring the use of EdTech to provide educational material to out-of-school children, encouraging them to go to school and/or support their re-enrollment in schools (for example with access to remedial digital learning material).

Lastly, no papers exploring or discussing the use of positive messaging to encourage children to go back to school was found in the search. This suggests that there is a research gap related to exploring how to use positive messaging to (re-)enroll children to school in Kenya, and especially after Covid-19. This gap could be filled by providing research and empirical studies aiming at assessing approaches to directly guide children back to school, to receive support for sending children to school and other approaches to encourage parents and their children to participate in school-based education.

## 5.5. Girls education and technology

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In many countries, girls often do not benefit from the same education opportunities as their male counterparts. Enabling more girls to access education can have a significant impact on reducing economic and social inequalities - and equitable provision of technology can result in improved learning outcomes for girls. The potential impact of girls' engagement with EdTech indicates that it should be considered an important topic to be investigated through research.

The search found that 10 papers explored the theme of using technology to improve access to education and increase learning for girls ([↑Wims & Lawler, 2007](#); [↑Kiptalam & Rodrigues, 2010](#); [↑Redempta, 2012](#); [↑Kiptalam & Rodrigues, 2013](#); [↑Jukes et al., 2017](#); [↑Wambuqu, 2018](#); [↑Allier-Gagneur et al., 2020](#); [↑Langthaler & Bazafkan, 2020](#); [↑Allier-Gagneur et al. \(2020\)](#); ). There are two sub-themes covered by the 10 papers, which are: girls' access to EdTech (n=7), and use of technology to improve learning outcomes for girls (n=4). These categories are not mutually exclusive as in some cases, papers included in one or more of these categories.

### 5.5.1. Girls' access to EdTech

Most of the studies that discuss girls' access (n=7) indicate that girls do not benefit from the same access to Edtech as their male peers ([↑Wims & Lawler,](#)

[2007](#); [↑Kiptalam & Rodrigues, 2010](#); [↑Redempta, 2012](#); [↑Kiptalam & Rodrigues, 2013](#); [↑Zelezny-Green, 2014](#); [↑Wambugu, 2018](#); [↑Allier-Gagneur et al., 2020](#); [↑Langthaler & Bazafkan, 2020](#)). For example, an empirical study that was based on surveys conducted with students, teachers and principals of 11 secondary schools from Nairobi and Rift Valley provinces, indicates that levels of use of computers was lower for girls than boys, both in school and outside of school ([↑Kiptalam & Rodrigues, 2013](#)). This study drew on a study conducted by a consultancy called *SchoolsNet Kenya*, which found that girls' schools had nearly a third fewer computers than boys' schools in Kenya ([↑Kenya Schoolnet, 2003](#); [↑Kiptalam & Rodrigues, 2013](#)). In addition to the number of computers in schools, this study also presented findings related to disparities in how computers are used in schools, suggesting that in boys' schools the computers are mostly used by the students, whereas in girls' schools they are mostly used for administrative tasks ([↑Kiptalam & Rodrigues, 2013](#)). This finding, related to potential gender disparities in how computers are used in Kenyan schools, is introduced as a topic for future research and further illustrates the need to avoid measuring access to EdTech with a singular approach consisting of counting hardware devices in schools and to also investigate how devices are used and by whom.

This study also compares technology access in private and public schools as well as between rural and urban settings for girls and boys and it found that gender disparities in technology access are the highest in public schools in rural areas in Kenya ([↑Kiptalam & Rodrigues, 2013](#)). It illustrates that in public schools, 41.2% of girls had regular internet access at school compared to 89.2% of boys. This study not only provides further evidence that potential disparities in access to EdTech are influenced by contextual and socio-economic factors, it also demonstrated that even when girls and boys attend the same schools, gender disparities in access to technology could be found. These findings also suggest that more research that explores girls' EdTech access in schools across different settings and contexts in Kenya is needed to design and implement equitable EdTech interventions.

An empirical study that used surveys with various different stakeholders in secondary schools in 2007 found that inequalities related to EdTech access also existed outside of school environments ([↑Wims & Lawler, 2007](#)). The study found that outside of school, 30% of girls reported being able to access to computers for educational purposes compared to 50% of their male peers ([↑Wims & Lawler, 2007](#)). Building on these findings, a similar study was conducted during Covid-19 ([↑Twaweza East Africa, 2019](#)). This study was based upon household surveys conducted in 86 out of 335 sub-counties in Kenya and across 42 of the country's 47 counties. According to this study, 22.1% of boys

compared to 22.2% of girls accessed digital learning materials during Covid-19 ([↑Twaweza East Africa, 2019](#)). Further investigation could build on this research by looking into potential disparities in learning outcomes and/or explore the factors that have contributed to the reducing of this gender gap and support equitable access. As Kenyan learners were asked to study at home during Covid-19, it could be relevant to understand the potential role that family members and teachers played in enabling girls to access EdTech during Covid-19.

### **5.5.2. Use of technology to improve learning outcomes for girls**

Using technology to improve learning outcomes for girls is discussed in four papers ( [↑Zelezny-Green, 2014](#); [↑Jukes et al., 2017](#); [↑Wambugu, 2018](#); [↑Allier-Gagneur et al., 2020](#)). These include a literature review conducted by [↑Allier-Gagneur et al. \(2020\)](#), where the authors touch upon the positive role that mobile phones can play in girls' education and as part of EdTech intervention that could be used to improve learning outcomes for girls. They refer to a study by [↑Zelezny-Green \(2014\)](#) that discusses how female students use their mobile phones to call peers to discuss and collaborate on assignments. The authors state that "This type of collaboration, which can take place at any time, allowed them (girls) to create connections between formal learning in the classroom and informal learning" ([↑Allier-Gagneur et al., 2020](#), p.13). The potential role of mobile phones and collaborative learning opportunities for girls' education is also explored in a mixed-method empirical study about the impact of the Health And Literacy Intervention (HALI) ([↑Jukes et al., 2017](#)). *HALI* was a project that sought to improve the literacy outcomes of schoolchildren, to reduce their burden of Malaria and to investigate the interaction between these two objectives. Amongst other activities, the project involved the use of mobile phone messaging to encourage teachers to provide literacy and collective support to students, and focuses on rural government primary schools in Kwale and Msambweni districts. The findings of this study illustrate that this mobile phone intervention had a more significant impact on the attainment of girls than boys in most areas of learning. According to the authors, "At 24 months, greater beneficial effects were observed for girls in English word identification..., English passage-reading fluency...and Swahili passage-reading fluency" ([↑Jukes et al., 2017](#), p.21). Given these outcomes, there is a need for further research investigating why certain devices such as mobile phones used during EdTech interventions appear to contribute to creating a greater impact on girls' attainment, and what are the additional factors that contributed to these findings.

The literature reviewed suggested that a clearer understanding is needed of the factors that affect gender disparities in EdTech use, both at home and in school environments in Kenya. These factors could be used to design EdTech interventions that promote equitable learning outcomes for girls and boys. The literature search also revealed the necessity to include data related to girls' EdTech access and learning outcomes across different Kenyan contexts and settings, for example in urban and rural contexts and/or in public and private schools. There is also a need for research into the use of technology to improve learning outcomes for girls and nascent evidence about the suitability of mobile phones indicates that particular attention should be paid to ascertain how, why and under what conditions using these devices can contribute to creating a positive impact on girls' attainment. Overall, it was also found that limited research exists on the use of EdTech to implement back-to-school campaigns or to improve attendance and retention of girls at school. As the dropout rate of female students in Kenya is high<sup>1</sup>, and are likely to be amplified due to Covid-19<sup>2</sup>, such research would be beneficial to stakeholders seeking evidence-based strategies to enable girls and boys to have access to equal and egalitarian EdTech opportunities.

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<sup>1</sup> While current statistics are not available at the time of publication, previous datasets from the Kenya National Bureau of Statistics indicate that the rate of dropout for secondary girls is over 50%.

<sup>2</sup> While this is reported from anecdotal and emerging global evidence (see for example [Malala Fund, 2021](#)), indications from interviewees confirms this emerging trend.

## 6. Summary of political economy analysis

The purpose of this Political Economy Analysis (PEA) summary is to give a clear understanding of:

- which organisations and people are important to EdTech evidence uptake;
- why those bodies and people are important;
- how EdTech decision-making is made linked the EdTech Hub focus areas;
- how EdTech evidence is used (and opportunities for it to be used more);
- what are the most important aspects of education research in Kenya to ensure uptake, policy change and impact over the next five years.

The analysis has combined desk-based research with anonymous and informal interviews with 5 influential individuals (referred to as participants) in the Kenyan education system including government, researchers and NGO implementing partners. The analysis specifically looks at:

- The government education system (as opposed to private alternatives),
- Primary and secondary levels,
- The role of evidence in relation to EdTech,
- The political economy at this point in time, with particular emphasis on national changes to the EdTech landscape after the 2016 elections.

The EdTech ecosystem in Kenya is dynamic and decentralised due to the many departments and commissions within the Ministries of Education and ICT, the relatively large scale of tech startup investment relative to neighbouring economies, and the dynamic non-profit sector deeply involved in education. In interviews this has been characterised as ‘fragmentation’ especially with regard to research, since the diverse decision-making bodies act independently, with little coordination and limited centralised control.

Within this context, stakeholders inevitably have different priorities and interests in research and EdTech. This section, building on the basic information presented in the context of section 2, does not exhaustively

represent the full breadth of interests but serves primarily as an introductory overview to the dynamics that inform research uptake in policy and practice.

## **6.1. Drivers of EdTech decision-making**

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The range of actors involved in EdTech in Kenya has been broadened by political goodwill to specifically promote access to devices in schools. While this process has reflected a positive attitude towards technology adoption and integration, it has also broadened EdTech decision-making from purely operational and pedagogical considerations which have governed it, into a political domain attracting much broader attention. Nonetheless the structures in place, both economically and politically, continue to influence the implementation of EdTech initiatives on both a micro and macro level.

### **6.1.1. Government priorities and initiatives**

Government involvement in EdTech falls under both the MoE and the MoICT, each of which has a number of autonomous and semi-autonomous commissions, institutes and programmes. The most repeatedly mentioned by interviewees were the KICD, TSC and from a research perspective, NACOSTI. Yet dozens of other ministerial bodies govern and influence various aspects of policy and practice, making a joined-up approach and strategy virtually impossible.

Where priorities of governmental stakeholders are operational and internally-driven by educational exigencies, they maintain some strategic coherence, despite the breadth of services offered. This can be seen in the broad digitalisation efforts of curriculum and administration. Where political agendas have been introduced into educational decision-making, they represent externalities, the already delicately-balanced interplay between existing stakeholders. In any educational system, the competing interests of teachers, schools and administrators can lead to friction, but in Kenya the sheer volume of governmental bodies, not to mention their differing structures and operational realities, complicates these issues even further. There have also been successive waves of decentralisation and recentralisation of authority over the last decade which contribute to a lack of clarity around how decisions are taken and by whom.

### **6.1.2. NGOs**

The NGO or third sector is very active in Kenya, which often serves as a regional base for international organisations involved in education in multiple countries in East Africa. This inevitably means that education programming in Kenya is not solely the preserve of the government, but is influenced by the priorities



and agendas of internationally-funded organisations. While school-based educational programmes must meet standards set by the government, a large number of educational initiatives beyond formal schooling are set by supplementary educational initiatives. These are not necessarily at odds with the national priorities but they may be isolated or fragmented from larger strategies and policies.

Specific programmes and projects funded by NGOs have been presented in section 4.2, but from the perspective of PEA, the role of significant donor-funded initiatives that support these, such as the GPE and GEC, can be further highlighted

### **6.1.3. Tech sector**

Kenya is a hub for innovation and investment in technology within the region, and in this crowded marketplace of new ideas, education is among those receiving significant attention. This can be seen in the number of EdTech startups in incubator and accelerator programmes like [C4D Lab](#), [iHub](#), and [mLab](#). The internal market, amongst parents primarily, for applications and services that supplement existing learning, is only the first consideration for such growth-minded startups, as they consider a broader international audience. This leads to clustering of ideas around the perceived needs and gaps in existing education, but also an emphasis on scalable and (usually) profitable interventions.

Additionally, a particular gender lens may be noted in the success stories of the tech sector in Kenya, some of the most successful tech entrepreneurs have been women, such as Ushahidi founder Ory Okolloh-Mwangi, and Linda Kamau of AkiraChix. Through coding education programmes such as AkiraChix, Akili Dada and Kami Limu, as well as prominent academics such as Chao Mbogho, dean of Kenya Methodist University's school of computer science, there is a notable emphasis on female participation in the tech sector.

## **6.2. Research priorities**

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Priorities for EdTech research in Kenya are largely determined by demonstrating an evidence base for a particular intervention or programme. This has resulted from and contributed to the fragmentation of the ecosystem, as there is not a clear mechanism for strategic alignment of different research priorities, nor an institution through which research can be joined up, or even easily discovered. National research bodies and research approval processes are underfunded and overstretched, making the aggregation or comparison of data from different studies very difficult. Few broad evidence syntheses have

been undertaken and what little there is relies on research produced outside of Kenya.

The priorities of the most prominent researchers, outlined in section 4.1, do retain independence from national political concerns, at least on the surface. However, they are much more influenced in each case by the agendas of international donors and NGOs, with whom they are affiliated. The methodological priorities of rigorous quantitative research can be seen in the emphasis of Piper on RCTs, while the emphasis on programme evaluation can be seen within not only the three most prominent and prolific academic authors, but also throughout the research ecosystem. The emphasis of research as programme evaluation, while not problematic per se, does reflect the responsiveness of the EdTech research sector in broad strokes.

### **6.3. Partnerships and scaling**

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Kenya presents a unique set of opportunities and challenges, with regards to EdTech - the strong government buy-in, and vibrant tech ecosystem suggest high potential for growth and scaling. Indeed a number of technology interventions have already demonstrated growth and impact on development outcomes has already been identified in such everyday applications as mPesa. Despite the relative success of a number programmes and interventions in section 4.2, especially in the case of partnerships, such as Tusome and Uwezo, iterative stages of growth and scaling have been limited. Interviews with implementing partners from the private and third sector suggest that limited understanding of government requirements (largely from KICD) for engagement which touches on curricular issues, has led to a backlog of suitability testing, an important tool in maintaining oversight of third-party interventions.

Clearer processes for partnering with the government, specifically KICD, could effectively lay the groundwork for partnerships between stakeholders, with great efficiency and diversity of input. However, this is current frustration on all sides, largely determined by the lack of funding afforded to digitalising key teaching and learning materials and resources.

## **7. Emerging priorities and opportunities for collaboration**

In this review, we have drawn upon a range of sources — including contextual statistics, policies, political economy analysis, and the existing research

literature — to present an overview of the landscape of EdTech research in relation to school-level education in Kenya. Although progress has been made in improving access to education, inequalities exist, for example in relation to socio-economic lines, urban and rural contexts, and gender (see Section 2). Kenya has an established and growing community around EdTech research (Section 4). As a result, we were able to draw upon a substantial body of existing research literature (Section 3), and explored mapping the literature on to EdTech Hub’s focus themes (Section 5). Finally, we explored the influential actors and dynamics in relation to education and technology within the Kenyan educational system through PEA (Section 6). The importance of coordinating research was underscored through the interviews which informed the PEA, as the importance of new research building on existing research was seen as difficult to realise without adequate coordination between research bodies. Considering both gaps which emerged in Section 5, and the practicalities of the operating context outlined in Section 6, we have identified five areas as being potentially valuable focal points for EdTech Hub and its future work.

### **7.1. Technology to support personalised learning and teaching at the level of the student**

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Personalised learning was the area with the least demonstrated evidence in the EdTech literature, and research on this area is limited. The relatively low cost of devices and airtime, as well as the mature mobile ecosystem, joined with the emphasis of rollout of personal devices in classrooms, suggests that use of personal devices among students will be higher in Kenya than similar economies. This presents a greater opportunity for personalised learning with personal devices, but this remains a speculative possibility for the most part. Reviewing the literature on this topic (see Section 5.1.) revealed a gap related to understanding how technology can be used most effectively to personalise learning in an effective, cost-effective, and contextually appropriate way in Kenya. In addition, it was also found that teachers’ role in making technology-supported personalised learning effective, aligned to their needs and applicable in their everyday practices has also received limited attention. This is in addition to research needed to explore whether (and if so, how) personalised approaches that feature technology adapting or adjusting to learners’ individual needs are effective in leading to better learning outcomes.

## **7.2. Teacher professional development, structured pedagogy, and technology**

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The focus area covered in most depth by the EdTech literature in Kenya is TPD, with 35 papers on the subject - demonstrating the significant attention this area has within the EdTech ecosystem in Kenya. Indeed, the importance of teachers within the educational system structure is underscored by the primacy of the Teachers' Service Commission as the only independent commission within the MoE, as well as the KICD being among the most influential (with curriculum strongly integrated with teaching practice). Reviewing the literature on this topic (see Section 5.2.) demonstrated the weight of expectation that technology can be a catalyst for improving teaching quality, which [Piper, et al.\(2017\)](#) highlights as the biggest challenge in the educational system. However, the evidence in the literature points to a gap between understanding teachers' perceptions and attitude to technology (covered in 6 studies) and their competence with technology (16 studies), without joining this up with robust qualitative evidence around the drivers and factors that improve and promote changes in pedagogical practice with EdTech. This research opportunity to understand the mechanisms for change in teaching practice would complement existing research while also building bridges between the significant investment already made in researching EdTech for TPD in Kenya. Our literature review also revealed the need to use evidence to inform initiatives and investments intending to upskill teachers' digital literacy. Lastly, it was also found that the ongoing, continuous nature of TPD tended not to be acknowledged or built upon in the studies found, this is considered important for future research as it could contribute to sustainably and gradually improving teaching practices and children's learning outcomes in Kenya.

## **7.3. Technology to advance data-use and decision-making in education**

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The use of technology for data-driven decision-making was the area with the second most attention in the literature, after teachers. The strong emphasis of technology in schools as a governmental priority has largely been politically driven, and focused on personal devices. Yet, in order for this to be rolled out, data systems to join up these devices is of paramount importance. Data collection with mobile devices has an iconic place in Kenya, since the role of reporting platform Ushahidi in the 2007-8 post-election crisis, and this has been applied to education as well, albeit in a piecemeal fashion. The *Tusome* programme introduced a successful case study where various strands of activity related to using handheld devices for data collection and analysis,

including school-level data as well as national and local mechanisms to analyse and use data. It could be used as emerging evidence to inform future research, as moving beyond data collection, and towards data use, and analysis is presented as a key research area in Kenya. Despite the significant interest in this topic for the EdTech research ecosystem in Kenya, the drivers of change, and the analysis of how data can inform decision making, need to be better understood. Further rigorous qualitative research on these mechanisms presents an opportunity for maximising the benefits of the other research undertaken. This research could be used to further understand how technology could be used to improve policy planning and strengthen education systems, which also emerged as a gap in the literature reviewed.

#### **7.4. Technology to promote access and participation in school**

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Kenya's emphasis on universal primary education has led to great gains in access, however issues related to enabling out-of-school and hard-to-reach populations to access education still exist. This is particularly true among the rural pastoralist communities of north and north-east Kenya, as well as the very large, and mobile refugee populations. The literature reviewed (see Section 5.4.) revealed very limited evidence related to understanding how, if, and/or the extent to which, technology could be used to deliver quality, contextualised and cost-effective education to out-of-school, SEND and refugees/displaced children in Kenya. While there has been no specific research on using technology to nudge messaging to increase participation and sustain school attendance, the use of mobiles to disseminate important messages amongst communities with high rates of children out of school demonstrates the possibility for future research in this regard.

#### **7.5. Girls' education and technology**

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Girls' education is a major priority for donors and governmental entities in Kenyan education ([GPE 2020](#)). The employment opportunities recognised within the tech startup sector are held up as an opportunity for successful transitions for girls from education to employment (see section 6.1.3). The literature reviewed (see Section 5.5.) suggested that there is a research gap related to understanding drivers that affect gender disparities in EdTech use in Kenya, both at home and in school environments (including urban and rural contexts and/or in public and private schools). It was also found that limited research exists on the use of EdTech to implement back-to-school campaigns or to improve attendance and retention of girls in school. Conducting such research could be beneficial to stakeholders seeking evidence-based

strategies to enable girls and boys to have access to equal and egalitarian EdTech opportunities.

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## 9. Annexes

### 9.1. Annex A: Search terms

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Two sets of search terms facilitated searches.

#### **Set 1 (title, abstract, and keyword searches only):**

Kenya AND

EdTech OR “Education technology” OR “technology enhanced” OR “e-learning” OR “computer-assisted” OR “computer-supported” OR “computer-aided” OR “blended learning” OR “distance learning” OR “digital learning” OR ICT4D OR “Intelligent tutoring system” OR “adaptive learning” OR “mobile learning”

**Set 2:**

“Kenya” AND

Education OR Learning OR Teaching OR Classroom AND

EdTech OR technolog\* OR Digital OR Remote OR Internet OR “Social Media” OR “Distance learning” OR Online OR Mobile OR Phone OR Virtual OR Laptop OR Tablet OR comput\* OR televis\* OR Device OR Software OR MOOC OR ICT OR Video OR radio OR “blended learning” OR e-learning OR “management system” OR “LMS” OR VLE OR SMS

## 9.2. Annex B: Additional EdTech projects

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**EdTech projects that were not discussed in empirical studies or evaluation research:**

### Eneza Education

<https://enezaeducation.com/>

Eneza is based on offering a feature-phone based learning platform that enables users to access educational programmes and ask questions to teachers ]through SMS. This platform is targeted at learners and teachers living in rural and marginalised communities in Kenya where challenges related to access educational resources were reported.

### Ubongo

<https://www.ubongo.org/>

Ubongo creates localised and multi-platform educational media, facilitated through TV, radio, YouTube, mobile app, ebook, interactive voice response (IVR). Ubongo is an edutainment company that intends to create accessible EdTech tools, mostly targeted at improving reading skills and promoting social and behavioural change for children, caregivers and educators.



## **e-Limu**

<https://e-limu.org/>

e-Limu is a mobile application that intends to facilitate learning outcomes related to literacy development through videos and games. e-Limu main target audiences are primary school learners and refugees but also provides applications for teacher training.

## **eKitabu**

<https://www.ekitabu.com/>

eKitabu is based on creating low-cost, accessible, quality digital content facilitated through mobile or web apps. Their target end users are primary and secondary learners and learners with special needs.

## **Kukua**

<https://www.kukua.me/>

Kukua is based on offering educational mobile games to teach literacy and maths skills to primary-school learners. Some of these games can be played on mobile or web applications, on Youtube and TV.

## **Longhorn Publishers: e-Learning Platform**

<https://elearning.longhornpublishers.com/>

The e-Learning platform is targeted at delivering personalised e-Learning items in various digital formats to primary and secondary school learners. These digital formats include: Web app, mobile app, SMS and YouTube channels.

## **M-Shule**

[www.m-shule.com](http://www.m-shule.com)

M-Shule is an adaptive, mobile learning management platform intending to improve learning performance of primary school students across Kenya and sub-Saharan Africa.

## Arifu

<http://www.arifu.com/>

Arifu is a chatbot platform for improving learning outcomes and engaging, training and capturing insights on hard-to-reach learners, who do not have access to the internet.

## Tunapanda

<https://tunapanda.org/>

Tunapanda institute's objective is to bridge digital divides. As part of this initiative, TunapandaNET is a low-cost community wireless network whose goal is to build a digital ecosystem in education, health and business. Tech Dada is another programme of the Tunapanda Institute which aims to promote digital inclusion for young women in Kenya.

### 9.3. Annex C: EdTech Hub Sandbox in Kenya

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EdTech Hub has implemented a systematic experimentation called a *sandbox* in Kenya. A sandbox is a real-life location used for experimentation and creates a small and contained space to test with a proposed intervention. It allows us to safely learn and adapt in a small space before rolling out promising ideas more widely.

#### **The problem this sandbox addresses:**

Covid-19 school closures have impacted hundreds of thousands of learners in Kenya and are expected to lead to significant learning loss. This is particularly true for the most marginalised learners, who may not have access to any distance learning resources or instructional materials.

The goal of the [#KeepKenyaLearning \(KKL\) campaign](#) is to set clear expectations for parents and caregivers of what learning at home should look like, and provide them with access to digital and non-digital resources to support those learning experiences. Leveraging a wide network of over 30 Kenyan EdTech providers and community based education organizations, this campaign will curate learning content, disseminate it to caregivers through both on and offline channels (TV, print, radio), and foster a conversation that will allow parents and caregivers to showcase innovative ways in which they are supporting learning at home.

### **What EdTech Hub is doing:**

EdTech Hub and the leaders of KKL are in the early stages of this Sandbox (as of May 2021) and identifying the areas that need exploration. These are likely to include:

- Understanding the needs and motivations of caregivers, and the extent to which they have the resources, time, and willingness to engage in their children's learning at home.
- Exploring the most effective ways to message the importance of caregiver engagement in education, as well as guidance on how caregivers can effectively engage.
- Exploring the most effective communication channels (SMS, WhatsApp, Radio, TV) for disseminating "learning at home" resources for caregivers.

*Learn more about this initiative [here](#).*