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Educational Television: A Rapid Evidence Review

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Rapid Evidence Reviews

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

Contents

Abbreviations and acronyms

LMICs	Low and Middle Income Countries
RER	Rapid Evidence Review

Summary

This Rapid Evidence Review (RER) gives an overview of the recent literature concerning how the use of educational television might support children's learning in low- and middle-income countries (LMICs). In this review, educational television is defined as television designed with research-based knowledge of how children use and understand television that systematically incorporates academic or social curricula into its content. In low-income contexts, educational television material could be delivered through videos played in schools that are supported by corresponding teacher guidance (e.g. the Mexican school-based *Telesecundaria* programme), or broadcast on public channels (e.g. the Tanzanian animation, *Ubongo Kids*). As such, certain educational television projects are capable of functioning even in circumstances where access to formal schooling facilities is restricted. This review therefore provides information that is particularly valuable in the context of the COVID-19 pandemic.

This RER began with a semi-structured search of the academic literature. Literature searching was conducted in a focused manner to ensure that those responsible for COVID-19 response strategies received relevant information in a timely fashion (see methodology). All literature identified through this search that was retained for analysis was: relevant to educational television use, concerned children between 3 and 18 years, and published in the past 20 years. Further, the majority of this literature came from LMICs. These inclusion criteria are provided below (see Literature searching approach and eligibility criteria).

The selected educational television-focused literature was thematically analysed, leading to four core findings:

1. **Academic outcomes**. The studies suggest that educational television can benefit children's learning outcomes in core subjects.
2. **Socio-emotional outcomes.** The literature indicates that both social reasoning skills and attitudes towards impairment could be improved by watching appropriate shows.
3. **Factors surrounding television viewing**. This review examined the social context of watching television and viewing television-based content on multiple media platforms (or multi-platform viewing). The limited material published on this suggests it is possible that exposure to educational content on multiple platforms can provide educational advantages over watching television alone. Further, children in LMICs frequently watch shows with others, a practice called co-viewing. Co-viewing could provide both direct and indirect

benefits when co-viewers are engaged (involved in commenting on, judging and explaining television content).

4. **Access and cost effectiveness**. The evidence suggests that access to educational television content is relatively high in LMICs. Research also indicates that television interventions can provide a cost-effective approach to raising learning outcomes, although further investigation in this area is required.

The findings concerning academic outcomes (Theme 1) and socio-emotional outcomes (Theme 2) suggest that quality educational television initiatives are an appropriate option to policymakers seeking to improve core learning and socio-emotional outcomes in the context of the COVID-19 pandemic and associated widespread shutdown of schools. A thematic analysis of Theme 3 literature suggests (among other things) that interactive co-viewing could augment child learning from educational television use. The literature relevant to Theme 4 suggests that appropriate television-based interventions could improve these outcomes among large numbers of children in a cost-effective manner, yet programmes created for at-home viewing might be less accessible for those in rural areas.

1. Introduction

Broadcast technologies like television currently play a particularly important role in delivering education. Physical distancing policies employed to stem the COVID-19 pandemic are limiting school attendance. This has led to increased focus on the potential for education technology to help sustain learning. This review focuses on educational television use with regard to core learning outcomes, socio-emotional concerns, factors surrounding television viewing and cost effectiveness. We hope to further an understanding of educational television use which supports policymakers, practitioners and caregivers who are considering the application of television-focused initiatives in the current global context.

1.1. Purpose

In this review we consider how educational television might support children's learning during the COVID-19 pandemic and beyond. Educational television use is considered a useful focus due to the potential effectiveness (e.g., Borzekowski, 2018) and scale (e.g., Watson et al., forthcoming) of initiatives centred on this platform. This television-focused review is situated alongside other RERs carried out by the EdTech Hub, which concern radio use, girls' education, refugee education, personalised learning, and equity in education. It is envisaged that the recommendations stemming from this review will inform readers on why and how educational television might be employed in LMICs. These recommendations should, however, be used to supplement readers' own context-specific knowledge (where appropriate) and is not presented as general advice to be applied homogeneously.

1.2. Research questions

Two research questions guided the study:

1. *What are the key emergent themes in the available literature on educational television use in LMICs?*
2. *What are the key recommendations that can be drawn from the available literature to inform policy on educational television use during the COVID-19 pandemic and beyond?*

1.3. Structure of the RER

The next section of the RER explains the methodology, describing the initial topic scoping process, literature searching approach and eligibility criteria. Findings across four themes are then presented in section 3.

Section 4 concludes with a series of recommendations for decision makers.

2. Methodology

The methodological approach for this review was informed by the Cochrane Collaboration Rapid Reviews Methods Group interim guidance on producing rapid reviews (Garrity et al., 2020). This permits a rigorous and systematic approach, while defining the scope narrowly enough that it can be completed within a short time span. This RER is a review of primary studies, in contrast with some other rapid evidence assessments such as the Education Endowment Foundation's (2020) review of systematic reviews on remote learning. After defining the research questions and eligibility criteria, a brief scoping review was conducted to help elicit relevant search terms for our search queries. Details of both the search-term scoping review, as well as the eligibility criteria for the discovered literature, are provided below.

2.1. Initial topic scoping

The literature searching process began with topic scoping. Topic scoping is a process conducted prior to carrying out a full rapid evidence or systematic review in which the key concepts and ideas that define a field are explored and discovered (Daudt et al., 2013; Levac et al., 2010). Notably, topic scoping is not intended to map out all concepts addressed in the literature. Instead, it has a more specific focus: to identify keywords and terms that have been used in studies concerning the use of educational television.

The scoping process began by recording potentially relevant keywords and terms already known to the authors, which were then used to search for literature. The process became iterative, with the terms found in one article leading to searches for other articles that then occasionally revealed new terms. Using this method, a list of search terms was compiled (Annex B). It is important to note that when a search term brought up an article with a relevant title, those articles were saved to be screened later alongside those that were found during the main literature search.

2.2. Literature search and eligibility criteria

Figure 1 details the process used to arrive at the articles that were thematically analysed in this review. The process began with literature searching, which was conducted using a structured approach based on the search terms established through topic scoping. These search terms were input to the Searchable Publication Database (a resource developed by the EdTech Hub of over 3 million records to date) and the following search engines: Google Scholar, Web of Science and the Education Resources Information Center. Two other supplementary methods were used to find literature: snowball searching from the reference lists of key

sources and informal within-team interviews. Snowballing and interview-based search methods were employed in acknowledgment that some important sources might be missed through structured approaches alone.

After literature searching, literature screening was conducted according to the eligibility criteria laid out in Table 1. Literature was not excluded based on quality or peer-reviewed/academic status. While this might mean that findings do not always rely on the most rigorous research, examining exclusively academic, peer-reviewed literature would have caused the RER to be narrower and less generalisable and to have taken fewer voices from LMICs into account (as there is less of an academic publishing culture in LMICs than high-income countries). The screening process did, however, involve the exclusion of articles written prior to 2000. This decision was made to ensure that the cited literature was relevant to an ever-evolving technological landscape (Fisch, 2017). Further, the included literature focused exclusively on children between 3 and 18 years. This age range is intended to encompass all children that can meaningfully engage with educational television. As such, this range is inevitably broad. Such breadth is susceptible to criticism, as the media content of interest to preschoolers and late adolescents differs starkly (Valkenburg & Piotrowski, 2017). However, the selection of a wider age range enabled the use of studies from LMIC contexts to support most points made in this review. LMIC studies are prioritised in accordance with the research focus of the EdTech Hub, under which this review is produced. Key educational television research concerning high-income countries is only used to support arguments where LMIC-focused literature remains sparse.

Figure 1. *Literature search and screening process.*

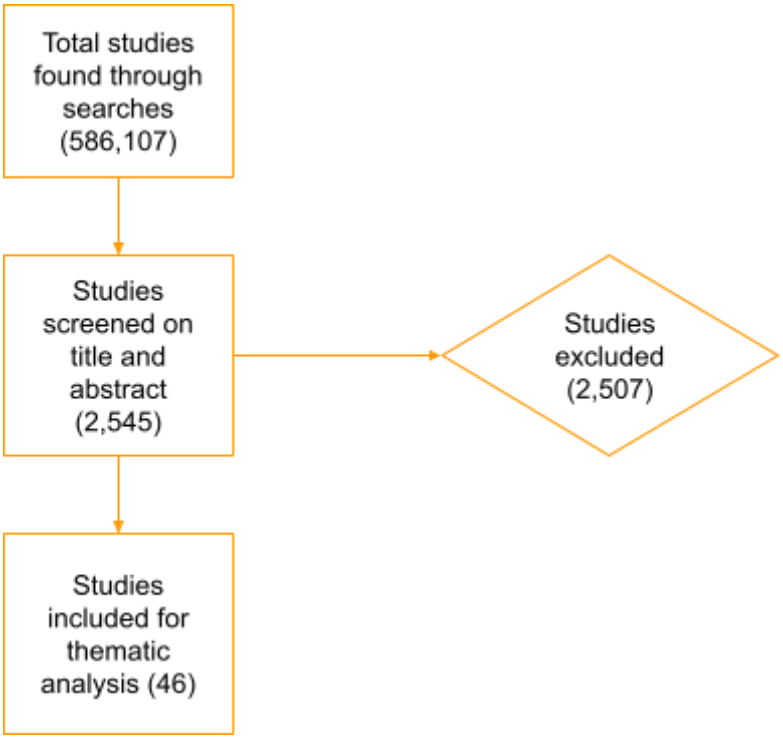

Table 1. *Eligibility criteria for literature searches and screening.*

Criterion type	Inclusion criteria
Age	3–18 years
Geography	LMICs
Literature type	All
Date	2000–2020

Upon completion of the literature search and screening process, 46 papers were thematically analysed. This analysis helped address the first research question by uncovering the following four themes: academic outcomes; socio-emotional outcomes; factors surrounding television viewing; and access and cost effectiveness. Each theme is discussed in turn below.

2.3. Themes

A thematic analysis of all papers identified through literature searching and exclusion (outlined below) led to the development of four overarching themes. Within three of these themes, the literature was divided into two subthemes. The themes and subthemes discussed below are:

- Educational television for academic outcomes
- Educational television for socio-emotional outcomes
    - Social reasoning
    - Impairment-specific attitudes
- Interactive co-viewing and additional EdTech platforms
    - The social context of television viewing
    - Television viewing through multimedia platforms
- Accessibility and cost effectiveness of educational television interventions
    - Rural and minority access to television
    - Cost and cost effectiveness

3. Findings

In order to address the second research question concerning policy recommendations, this review provides findings on the four themes listed above that emerged from the literature on educational television use.

3.1. Educational television for academic outcomes

Research attention has predominantly focused on the relationship between educational television use and academic outcomes. To consider this research, this review focuses on evidence concerning numeracy and literacy. It is acknowledged that some educational content might concern alternate academic topics such as science (e.g. *Bill Nye the Science Guy* and *Ubongo Kids*). Numeracy and literacy are, however, considered to provide a worthwhile focus given (a) their prevalence across the educational television literature focusing on academic outcomes and (b) their ability to predict wider academic success as well as other developmental outcomes (Letourneau et al., 2013; Psaki et al., 2017). In this section we report findings from 12 research articles identified through literature searching (marked in Annex A: References).

3.1.1. Findings and implications summary

- The included studies concerning educational television suggest that it is generally capable of supporting academic outcomes in low-income contexts.
- The research evidence features both controlled and naturalistic designs. The positive results from differing types of study are persuasive evidence for the efficacy of educational television use.
- Educational television best supports learning by making both the narrative and educational content as clear as possible. Effective television programmes also keep the narrative and educational content closely related to one another.

Educational television has regularly been found to make notable improvements to children's learning in LMICs. This statement is strongly supported by evidence concerning *Sesame Street* and its international adaptations. *Sesame Street* is considered to be a key component of the educational television landscape, as the programme and its 30 international versions are broadcast in 150 countries (Matza, 2019). A meta-analysis comprising 16 *Sesame Street* evaluations in LMICs suggested an average effect of d = .29 (Mares & Pan, 2013). Since this meta-analysis, evidence has continued to emerge for the potential benefits of this show (Borzekowski et al., 2019). Confidence in positive findings concerning *Sesame Street* is afforded by the controlled designs

used in the cited research: studies in Mares & Pan's (2013) meta-analysis primarily comprised laboratory and quasi experiments; Borzekowski et al. (2019) randomised schools' exposure levels and ensured Sesame Street was completely novel to all study participants. Further, research involving educational television use in unmanipulated home-viewing contexts is also available. This is provided by studies which use caregiver (e.g., mother) reports of *Sesame Stree*t viewership in a longitudinal design (Lee, 2009) and children's ability to recognise characters in a cross-sectional approach (Rimal et al., 2013).

Beyond *Sesame Street*, different programmes appear to have supported academic outcomes in LMICs. *Akili and Me* is an educational animation for early years children broadcasting across 40 countries in sub-Saharan Africa. This programme appears to promote both literacy (b = .29 for letter identification, b = - .77 for 'English skills') and numeracy outcomes (b = 23 for shape knowledge, b = .64 for number recognition, b = 1.13 for counting) among children in Tanzania (cited statistics, Borzekowski et al., 2019b) and Rwanda (Borzekowski, 2018). Educational animation has also been helpful for numeracy (b = .13) among Tanzanian viewers (age 6-16) of *Ubongo Kids* (a popular show which, like *Akili and Me*, is televised in 40 countries: Watson et al., forthcoming). Considering these studies together gives compelling evidence that international versions of *Sesame Street* and certain other educational television shows aid academic outcomes. Caregivers and policymakers should therefore be aware that certain educational television initiatives could provide a means of supporting children's academic development both during and after the COVID-19 pandemic.

It must be recognised, however, that certain programmes might promote academic outcomes to a greater extent than others. Efficacious educational television may possess one or more aspects of programme design. A show may have been produced in a developmentally appropriate manner by targeting relevant skills for a narrow age range (consultation with Deborah Nichols, 2020). Alternatively, a show might be built on strong theoretical principles such as the 'capacity model' (Linebarger & Piotrowski, 2010): this model proposes that viewers' learning capacity is determined by (a) their processing of narrative, (b) their processing of educational content and (c) the distance between narrative and educational content (Fisch, 2004). For example, the efficacy of *Ubongo Kids* in improving academic outcomes can be explained in terms of maximising child comprehension (Watson et al., forthcoming), in accordance with the capacity model. *Ubongo Kids*' creators conduct regular formative research to ensure that the programme material is presented in a clear manner so as to reduce processing demands (Fisch,

2004). *Ubongo Kids* also uses the same characters in each episode which reduces narrative processing demands by ensuring that children have pre-existing programme knowledge (Piotrowski, 2014). Additionally, stories are interwoven with educational content, minimising the distance between narrative and educational content (Fisch, 2004). Practitioners involved in the creation of educational content should take care that their programme design processes are likely to promote academic outcomes. Caregivers can assess potential usefulness of television programmes using criteria offered by the capacity model.

3.2. Educational television for socio-emotional outcomes

The benefits of educational television can go beyond academic outcomes to encompass other outcomes that are pivotal to child development: namely, socio-emotional outcomes. The holistic perspective on learning is crucial, not only to ensure that EdTech initiatives for international development are building rounded citizens for the 21st century, but also because such socio-emotional dimensions are strongly associated with successful learning in core subject areas (e.g., Lei et al., 2018). Accordingly, we report the associations found between educational television use and improved socio-emotional outcomes. Socio-emotional learning can be defined as "*the process of developing the ability to recognize and manage emotions, develop caring and concern for others, make responsible decisions, establish positive relationships, and handle challenging situations effectively*" (CASEL, 2005, p. 1).

The identified educational television research concerning socio-emotional outcomes (comprising ten items marked in Annex A: References) broadly relates to two distinct topics: *socio-emotional outcomes* and *impairment-specific attitudes*. Socio-emotional outcomes concern children's interpersonal outlook, including attitudinal patterns that relate to inclusiveness, cooperation, peer pressure, bullying and conflict (sub-theme 1). Impairment-specific attitudes are patterns of socio-emotional responses to those with disabilities and medical conditions in particular, such as HIV or AIDS (cf. Mares & Pan, 2013 for precedence of this classification, sub-theme 2).

3.2.1. Findings and implications summary

- Studies in South Asia and sub-Saharan Africa have suggested that educational television can support the development of prosocial skills such as sharing, cooperation and conflict resolution.

- Such findings should inform both caregivers and policymakers that prosocial reasoning can be enhanced through exposure to appropriate educational television.
- Viewing educational television shows featuring characters with disabilities has promoted positive attitudes towards those with medical conditions, including physical disabilities and HIV/AIDS.
- Policymakers and caregivers might therefore encourage child viewership of educational television shows using contextually appropriate characters to deliver prosocial messages.

3.2.2. Social reasoning

Educational television productions have often sought to improve socio-emotional outcomes. For example, *Sesame Street* endorses inclusivity through displays of peaceful cooperation among learners with observable diversity, including ethnicity and religion (Moland, 2020). In particular, engaged exposure to educational live action television has been found to help children to respond appropriately to challenging socio-emotional situations according to research on *Sesame Street* in India (Borzekowski et al., 2019). In the data collection for this study, children were shown picture cards that simulated challenging situations including bullying, peer pressure, conflict resolution, good versus bad touch, jealousy and getting lost. Participating children were then asked to indicate how they would handle the hypothetical situation (Borzekowski et al., 2019). The socio-emotional influence of exposure found corresponding support in Tanzania as it was positively associated with measures of empathy (or emotion recognition), cooperation and sharing (Borzekowski & Macha, 2010). These results suggest to policymakers and caregivers that certain educational television initiatives are capable of advancing children's social reasoning skills.

3.2.3. Impairment-specific attitudes

Educational shows in LMICs have consistently sought to promote favourable attitudes towards those with medical conditions (Mares & Pan, 2013). This is shown by their frequent inclusion of differently abled characters. In Bangladesh, children have viewed the UNICEF animation series, *Meena*, and the local variant of *Sesame Street*, *Sisimpur*, both of which featured disabled characters in key roles (Šiška & Habib, 2013). Similarly, a Canadian co-production of *Sesame Street*, *Sesame Park*, included a Muppet character called Katie, who used a wheelchair due to her physical disability. The manner in which these characters were included in *Meena*, *Sisimpur* and *Sesame Park* has demonstrated the normalcy of interaction between those who are differently abled. This

point is supported with regard to *Sesame Park*. When children observed the natural interactions between Katie and other characters in Sesame Park, they became increasingly able to "*identify with [those possessing physical disabilities] and see them as accomplished and valuable members of society*" (Segal et al., 2002, p. 373).

Educational programmes that appear to address impairment-specific attitudes have frequently concerned HIV/AIDS. Tanzanian children with greater exposure to Kilimani Sesame were more likely "*to say that an HIV positive child could play with others and that they would invite an HIV positive person into their home to share a meal*" (Borzekowski & Macha, 2010, p. 302). Similarly positive effects on HIV/AIDS understanding have been unearthed for television content such as Junction Juniors, a soap opera segment of the Kenyan show, *Know Zone* (de Block, 2012). Discussion of pilot Junction Juniors content where a daughter found that her mother had HIV led a caregiver to suggest that the content benefited viewers' HIV/AIDS understanding both directly and indirectly. Direct benefit was reportedly delivered as the show provided children with additional information on the condition. Indirect benefit was provided as Junction Juniors facilitated discussion on a topic that children and their caregivers could otherwise have been too embarrassed to address.

These findings have several implications. Policymakers should continue to support educational programmes that seek to promote respect towards, and positive perceptions of, those with medical conditions and disabilities. Caregivers could also become more confident that educational television viewing helps their children act in a more appropriate manner towards others (regardless of impairment). Lastly, practitioners responsible for content creation should continue to integrate characters that have medical issues pertinent to viewers' cultural contexts. Indeed, there appears to be ongoing progress in this regard: popular educational programmes have recently introduced characters who have autism (Julia in *Sesame Street*) and albinism (Amani in *Ubongo Kids*, as discussed in Watson, 2020).

3.3. Interactive co-viewing and additional EdTech platforms

Co-viewing and supplementing children's educational television viewing with access to other EdTech platforms (e.g., educational apps) could help viewers to make the most of educational television. Considering how the effects of educational television viewing might be amplified is especially relevant during the COVID-19 pandemic, as television viewing is likely to become a more popular activity. The literature concerning factors around

television use derive from 14 studies (marked in Annex A: References) and can broadly be divided into two sub-themes. Namely, the social context of television viewing (sub-theme 1) and the use of multiple platforms including television to access educational material (multi-platform viewing: sub-theme 2).

3.3.1. Findings and implications summary

- Co-viewing can occur in both school and home contexts. This co-viewing can bring about direct benefits, if question-based discussion of televised content shifts the child-viewer's learning experience from a passive to an active one. Indirect benefits can also be obtained if adult co-viewers are guided on how to deliver (non-televised) educational content to children from television shows.
- In accordance with these findings, practitioners should develop educational television shows in ways that promote interactive co-viewing, and policymakers should seek to support projects that engender interactive co-viewing experiences.
- It is increasingly likely that televised content will also be accessed through additional media platforms. The limited research available on children supplementing television-based learning through access to other EdTech suggests that this could be a better way of engaging with educational television than watching television content only, but more evidence is needed.
- While the available literature concerning multi-platform access to television content suggests this to be positive for television viewing, the corpus currently appears too scarce to inform policy. Policymakers and practitioners should therefore continue to investigate the delivery of television-based interventions on additional platforms.

3.3.2. The social context of television viewing

Educational television has often been viewed in the company of others: a practice known as co-viewing. In school settings, television co-viewing might have occurred with a teacher. In the home setting, children could have co-viewed programmes with their own or a friend's caregiver. Lower-income caregivers and their children in American contexts could even be perceived to interact with television in a manner similar to how middle- and upper-income families interact with books (Linebarger et al., 2013). Interactive co-viewing (i.e., active mediation, Buijzen & Valkenburg, 2005) is where co-viewers comment on, judge and explain television

content, which is likely to provide several important benefits to learners. It has been recognised that interactive co-viewing "*can change the otherwise 'passive' viewing experience into one where children actively question content*" (Lackner 2000, p. 6; Lillard et al., 2015). Additionally, where adult-led questioning occurs, children could have been benefited to a greater extent from exposure to educational television. Research has suggested that open-ended questioning from a co-viewing adult concerning (a) mathematics or (b) the storyline and socio-emotional issues promoted learning among child viewers (Morgenlander, 2010). There could also have been indirect benefits. For example, adults might have taken child learning-centred ideas from episodes co-viewed with children and then used these ideas to support later child learning away from the television. This point is reflected in Cahill and Bigheart's (2016) suggestion that school librarians should apply ideas from educational television shows to their storytime sessions. In the context of COVID-19, it is acknowledged that co-viewing opportunities are now likely to be limited outside of children's immediate households. Yet, it could remain beneficial for practitioners to develop educational television programmes in ways that facilitate interactive child-caregiver or child-sibling co-viewing. Policymakers might also support those educational television projects that promote interactive co-viewing practices appropriate to applicable social distancing guidelines.

Certain environments could be more supportive of beneficial child-caregiver or child-sibling co-viewing. Such environments might involve a shared engagement in programme content among co-viewers (Wang, 2014). The likelihood of shared engagement could be increased by watching television content in a setting absent of "*food/snacks, toys [and non-co-viewing] adults' talking*" (Wang, 2014, p. 28). Regarding child-caregiver co-viewing, an adult's educational background and expertise with the televised subject matter would also affect the likelihood of beneficial co-viewing (Fisch, 2004). Adult co-viewers watching educational television with children could therefore attempt to create an environment facilitative of co-viewing and even familiarise themselves with the broadcast educational content, if they were aware of this before viewing.

3.3.3. Television viewing through multimedia platforms

Another factor that might affect television viewing is whether programme materials are also accessed through different media platforms. This is an important consideration, as programme makers have strived to research the integration of educational television content with new technologies

(Ballagas et al., 2011). Accordingly, children have become "*increasingly able to experience the content of their favorite television programs on multiple platforms*" (Lavigne et al., 2012, p. 117). Indeed, children are becoming more likely to choose an alternate media platform to television to consume their educational television content, particularly in America (Nichols, 2020). However it should be noted that there is a relative scarcity of research concerning multiplatform educational programming (Anderson et al., 2013).

The literature indicates that learning is supported when educational television viewing is supplemented by access to other EdTech platforms. Experimental research concerning *Cyberchase* suggested that the programme's effects were more consistent among those exposed to both online games and videos than either platform separately (Fisch et al., 2010; Fisch et al., 2014). These positive findings correspond with research indicating that learning from a non-technological project was enhanced by exposure to an intervention involving video content and associated online games delivered simultaneously (Flagg, 2016). The cited articles could suggest that the viewing of televised material on multiple EdTech platforms supports learning, yet these articles come from a corpus that is too scarce to inform policy. As such, policymakers and practitioners should encourage or carry out further investigation. Practitioners responsible for the creation of televised content should seek to provide quality educational material (noting the principles described above in the section, 'Educational television for academic outcomes') that can be used on the most popular platform in any given context.

3.4. Accessibility and cost effectiveness of educational television interventions

This section examines the educational television literature regarding access and cost effectiveness. These are issues of persistent importance to educational policymakers, which have likely assumed even greater relevance after the inception of the COVID-19 pandemic. The economic implications of COVID-19 could mean that policymakers responsible for allocating educational resources are now operating within tighter budget constraints. It is also now vital to focus on the accessibility of educational interventions, given the widespread school closures which reduce the current opportunities for regular formal schooling. The research falling under Theme 4 has been organised into two subsections: access to educational television among rural and minority populations (sub-theme 1), and the costs and cost effectiveness of educational television (sub-theme 2). In covering these topics, we present information from 12

articles identified through literature searching (marked in Annex A: References).

3.4.1. Findings and implications summary

- Television programmes intended for at-home viewing are a viable means of delivering educational content to low-income contexts. The identified literature suggests that household television access is widespread in low-income settings. It is not, however, ubiquitous and viewership of educational shows might be greater among those in urban environments.
- Television-based projects involving both technology provision and teacher support have been shown to contribute to the reduction of educational inequalities within low-income countries.
- While cost-effectiveness analysis concerning educational television initiatives has been scarce, the single recent result identified suggests that a Tanzanian-produced television show has been highly cost-effective.
- These findings indicate that appropriate educational television interventions are a viable option to policymakers seeking to carry out high-value interventions in LMICs. Accordingly, policymakers might consider increasing access to television technology in rural areas and schools (in a manner complicit with appropriate social distancing policies due to COVID-19).

3.4.2. Rural and minority access to television

The identified literature frequently considers access to educational television. Articles report that levels of television ownership are relatively high across low-income nations. One example is in Tanzania with 24% of children aged 6-16 living in households with a television (Watson et al., forthcoming, see also Engle et al., 2011; Mares & Pan, 2013; Trucano, 2005). In most LMICs, broadcast technologies (like television and radio) reach larger audiences than internet-based EdTech. Correspondingly, there are a large number of viewers of both television and specific educational television shows. Analysis of a national survey of Tanzanian children suggested that one in six had recently viewed the locally produced educational television programme, *Ubongo Kids* (Watson et al., forthcoming). Additionally, almost half of a national sample collected in Bangladesh viewed television every day (Khan et al., 2007, as cited in Mares & Pan, 2013). It must be acknowledged, however, that television viewership and access are not ubiquitous in either of these countries. Despite the reach of broadcast media in low-income contexts, potential

investors in television interventions should seek to verify that this pattern applies to their operating context (which could, for example, be more conducive to the delivery of television-style content on mobile platforms). Moreover, viewership of broadcast television might be more common among children in urban areas. Among the regular television viewers in Bangladesh, 83% of children in urban locations and 58% of children in rural locations watched the local version of *Sesame Street*, *Sisumpur* (Mares & Pan, 2013, p. 141). Policymakers considering investing in television programmes intended for home viewing should examine levels of television access both nationally and between urban and rural areas. These could have important implications: the high country-wide viewership levels in Tanzania and Bangladesh do not exclude the possibility that home-viewing television interventions could benefit rural areas to a lesser extent. As such, policymakers should exercise care such that EdTech investments do not exacerbate within-country educational inequalities (for further discussion of this concept, see Kelley-Salinas, 2000).

These considerations notwithstanding, it is possible that television initiatives can promote equitable access to educational resources. This appears to have been a key objective during the inception of television in India, where the medium originally focused on "*the cause of the marginalised*" (as demonstrated by the Kheda Communication Project: Shitak, 2011, p. 1). The Kheda Communication Project involved the provision of 650 television sets across 400 villages. This initiative might be described as an "*innovative experiment in using television for empowerment and participatory rural development*" (ibid, p. 9). This description reflects the fact that the television initiative covered "*controversial subjects such as caste discrimination [and] alcoholism*" of interest to multiple age groups, which were created through participatory programme making (ibid). Policymakers and practitioners should therefore recognise that where educational television interventions are supported by the provision of appropriate technologies, they could conceivably increase access to educational opportunities in an equitable manner.

Further, where educational technologies are used appropriately, these "*could contribute to solving traditional learning gaps, reducing the educational lag of the adult population, and consolidating a national education system that offers quality services to all sectors of society*" (Kelley-Salinas, 2000, p. 25). To support this point, it should be recognised that the *Telesecundaria* programme in Mexico has been operational for 52 years and currently forms the basis of education in 6 out of 10 public high schools (Gobierno de Mexico, 2020).

The key elements of the *Telesecundaria* course are a 15-minute television programme shown in class, accompanying textbooks and teacher guides, and the active involvement of the teachers themselves. The programme has contributed to substantial increases in student enrolment in Mexico where, twenty years ago, it was noted that the *Telesecundaria* "*appears to be the only way to serve a growing, scattered, and diverse potential population of middle school children*" (Kelley-Salinas, 2000, p. 33). The longstanding efficacy of the programme might be attributed to the fact that it (among other things) uses appropriate technologies, requires community participation, and involves extensive and continuous teacher training (Kelley-Salinas & OECD, 2000). The success of *Telesecundaria* suggests that policymakers could support the use of appropriate television learning within school-centred projects (in accordance with schooling restrictions in the context of COVID-19) to support a reduction in within-country inequalities. More specifically, policymakers could favour those television-based projects that involve both community participation and ongoing teacher training, as the success of previous projects has been attributed in part to these features.

3.4.3. Cost and cost-effectiveness

Reference to the low cost and high cost-effectiveness of educational television initiatives is common in the research literature. (Borzekowski, 2018, p. 58), for example, recognises that "*television in developing countries can serve as a cost-effective way to influence and affect learning*". It is also noted that television-based initiatives have relatively low ongoing costs (Trucano, 2005). When considering learning in out-of-school contexts, these assertions correspond with the identification that existing television ownership in LMICs is significant (e.g., Engle et al., 2011). This means that educational shows can be accessed by large numbers of home viewers, without the need for new technologies to be purchased.

Despite frequent reference in the literature to educational television being a low-cost intervention, only a few sources (published after 2000) give cost data. Among the multiple annual cost estimates available for the Mexican *Telesecundaria* project, the most recent estimate (for 1997) was just under USD$1,170 per pupil (identified by Perraton, 2005). Using data from a slightly earlier time (1996), *Telesecundaria* schools were found to be "*no more than 16% more expensive per student*" than general lower secondary schools, despite *Telesecundaria* schools having far lower student/class ratios (Wolff et al., 2002, p. 147). Additionally, Brazil's *Telecurso* programme for school leavers attempting to take primary and secondary exams cost approximately $26 per student (for the entire course: Wolff et al., 2002). *Telecurso*, like *Telesecundaria*, went beyond the delivery of televised material, as it also involved teacher supervision and the provision of

complementary written materials. Conversely, a non-published study concerning community screenings of the Indian variant of *Sesame Street* reported per-person per-screening costs of around 16 cents (Batada et al., 2016). This project involved episode screenings from televisions atop repurposed vegetable carts, brought to urban locations by local performers. Lastly, data concerning the broadcast of *Ubongo Kids* in Tanzania suggested that its per-person per-year costs were approximately 1 cent (Watson et al., forthcoming).

While the limited cost estimates identified appear disparate, the differences could be explained by the nature of television interventions. Higher cost estimates have concerned television interventions involving both teaching staff and the distribution of accompanying learning materials (Perraton, 2005; Wolff et al., 2002). The project involving screening of the Indian *Sesame Street* co-production involved neither of these features (Batada et al., 2016). Similarly, the very low per-person estimate identified for *Ubongo Kids* was based only on the costs surrounding the provision of televised content (Watson et al., forthcoming). Accordingly, policymakers should understand that the educational television interventions with the lowest costs per person are those that involve only the provision of television content. Yet even school-based television interventions (where appropriate during the COVID-19 pandemic) could be recognised as relatively low cost given that the *Telesecundaria* project was found to be comparable in price to conventional schooling, despite student-teacher ratios being lower.

It might also be recognised that comparing (or estimating) the costs of educational television programmes is dependent on (desired) programme quality. High quality content will typically cost a greater amount (Piotrowski, 2020). This might be due in part to the requirement for an iterative programme development process, where cases in which produced content found not to be enjoyable or educational informs the revision of television material (Nichols, 2020). This said, programme makers could seek to increase the likelihood of creating quality content from the outset by considering the appropriate research evidence, aligning the curriculum with the way that children learn and accounting for the local context (ibid).

Recent literature providing cost-effectiveness information relating to educational television programmes has been particularly scant (Mares & Pan, 2013). Various articles concerning educational television viewership that claim to give cost-effectiveness information provide insufficient data to compute an effect relative to amount spent. This was the case in both Wolff and colleagues' (2002) discussion of the *Telesecundaria* programme

and Batada, Banerjee and Subramanian's (2016) examination of a *Sesame Street* co-production in India. Only one piece of research (post-2000) was identified that provides a cost-effectiveness comparison featuring a television intervention (Watson et al., forthcoming). This article suggests the cost-effectiveness analysis estimate for the ongoing operations of *Ubongo Kids* to be considerably superior to those for all other forms of (non-television) interventions calculated using the same method. It must be recognised, however, that this finding concerned a specific television show in one low-income nation and was partially derived from a cross-sectional model (which could be considered less precise than approaches using longitudinal data). Those responsible for policy during the COVID-19 pandemic and beyond would therefore benefit from additional cost-effectiveness analysis findings featuring different shows, contexts and methods of establishing influence. If subsequent research were to support the identified *Ubongo Kids* finding, policymakers should recognise that educational television interventions provide a highly cost-effective means of improving learning outcomes.

4. Recommendations

Through analysis of the educational television literature, four core recommendations emerged concerning the use of educational television during and after the COVID-19 pandemic:

- Policymakers and caregivers interested in promoting children's academic outcomes should consider employing educational television. This is supported by evidence concerning educational shows broadcast to home viewers in different parts of the world.
- Similarly, viewing appropriate educational television content can advance socio-emotional outcomes. The creators of television programmes who are interested in socio-emotional development might seek to pursue this objective through the integration of characters with differing levels of ability.
- Research suggests that the effects of educational television on child learning outcomes could be enhanced by interactive child-adult co-viewing. Teachers and caregivers could attempt to engage in co-viewing, although social distancing policies and limited school access during the COVID-19 pandemic might restrict co-viewing opportunities involving members of different households.
- Policymakers could consider educational television initiatives when seeking to promote resource allocation, as the (limited) literature suggests that programmes intended for home viewing are highly cost effective. Policymakers should, however, take care that their support of such initiatives does not exacerbate within-nation inequalities, as viewership of educational shows in rural households is likely to be low compared to urban households.

It is hoped that these recommendations can supplement the context-specific knowledge of educational policy makers interested in educational television, practitioners operating in the television sector, and caregivers seeking to understand whether and how their children should watch educational shows.

5. Annex A: Bibliography

The following section presents references in a table, with a column on the right-hand-side (using blue text) showing which theme (if any) the referenced item is of relevance to.

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6. Annex B: Search terms

Searches were conducted using combinations of the following terms:

Educational television, Learn, Attainment, Outcome, Gain, Intervention, Ability, Capacity, Capability, Impact, Effect, Co-viewing, Co-discussion, Sesame Street, KnowZone, Akili, Ubongo, marginalised, equity, rural, developing countries, Latin America, out-of-school, socio-emotion, SEL, Teacher, School, multimedia, platform, multiple platforms, transmedia. Psychosocial, executive function, problem solving, collaboration, self-regulation, RACER, MELQO