

RAPID EVIDENCE REVIEW

EdTech for Learners With Hearing and Visual Impairments: A Rapid Evidence Review for the Southeast Asian Region

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Authors Annette Zhao
Jessica Hinks
Sarah Thang
Joel Mitchell
Asma Rabi
Noor Ullah
Rozina Zazai
Aime Parfait Emerusenge
Katrina Barnes
Jonny D'Rozario

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Reviewers Mdm Jamilah Kadir (Director, SEAMEO SEN), SEAMEO SEN Resident Experts, Heikhal Hamzah (Manager, Strategic Planning & Communication Division, SEAMEO SEN), Matt Thomas (Research Adviser, Jigsaw)

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Rapid Evidence Reviews

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

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Abbreviations and acronyms

ASEAN	Association of Southeast Asian Nations
ICT	Information and Communications Technology
RER	Rapid Evidence Review
SEAMEO	Southeast Asia Ministers of Education Organization
SEND	Special educational needs and disabilities
TCAD	Total Communication with Animation Dictionary
UNSDG	United Nations Sustainable Development Group
VSL	Vietnamese Sign Language

Executive summary

This Rapid Evidence Review (RER) provides an overview of existing literature on the use of educational technology (EdTech) for the education of learners with special educational needs and disabilities (SEND) in the Southeast Asian region, specifically those with visual and hearing impairments. It also summarises the current state and potential benefits of using technology for the education of these learners, and its limitations and challenges. The following countries are included in the review's scope: Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand, Timor-Leste, and Vietnam.

The RER involved a systematic search for academic and grey literature about the use of EdTech in the education of learners with visual and hearing impairments; a separate RER focusing on learners with cognitive and learning disabilities is also available (see [↑Mitchell et al., 2024](#)). After a two-stage screening process, we analysed 22 publications. Details on the inclusion criteria, as well as the associated limitations, are explained in [Section 1.6](#). The rapid nature of the review required a focused approach to literature discovery and a thematically guided process of analysis. As such, the search strategy was not designed to be exhaustive.

The findings of the thematic analysis of the relevant literature are structured along three themes:

- **Nature of EdTech for learners with visual and hearing impairments.** This theme discusses the types of EdTech interventions focused on the needs of learners with SEND.
- **Effectiveness / facilitating factors of EdTech.** This theme examines the ways in which technology delivers or supports education and learning, with a particular focus on the effectiveness of EdTech for education for learners with SEND.
- **Barriers of EdTech.** This theme explores how technology can create barriers for learners with visual and hearing impairments.

The key takeaways from this review are:

- Additional research and data are needed across Southeast Asia to understand how learners with visual and hearing impairments are learning, what works, and what additional support is needed.
- Practices that support learning for learners with visual and hearing impairments often support all learners, and governments should

provide these accommodations along with appropriate teacher training to ensure all staff are invested in these practices.

- Some of the barriers identified were not unique to learners with visual and hearing impairments.¹
- All learners need to be taught how to foster an inclusive environment for all their peers in the classroom, including by considering the needs of learners with disabilities.
- Governments and educators may also have further opportunities to embed established principles for supporting learners with disabilities into their practice.

¹ We use 'impairment' when referring to hearing and visual impairments specifically, and 'disability' more generally.

1. Introduction

This RER provides a summary of the potential benefits of using technology for the education of learners with visual and hearing impairments in the Southeast Asian region, as well as its risks, limitations, and challenges. It aims to offer insight and evidence that can assist in developing and implementing effective EdTech interventions in the target region and, particularly, in addressing the needs of learners with visual and hearing impairments.

1.1. Background

Despite countries in the Southeast Asian region ratifying the Convention on the Rights of Persons with Disabilities ([↑United Nations, 2006](#)), children with disabilities find it difficult to access a quality education ([↑UNESCO, 2023](#)). According to [↑UNICEF \(no date\)](#), 43 million children in East Asia and the Pacific have a disability. In the Southeast Asian region specifically, [↑UNESCO's \(2023, p. 22\)](#) Global Education Monitoring report states that 5% of learners in Malaysia and Cambodia and 3% in Vietnam and Laos have a disability. These figures may understate the number of learners with disabilities; at least one study has shown that census data may undercount people with disabilities due to factors such as an unwillingness to self-identify, a lack of understanding of disabilities by participants and enumerators, and census options not including a comprehensive list of disability types ([↑ UN Timor-Leste & Belun, 2018](#)). Learners with SEND often do not have the same access to education as their peers. For example, in Cambodia, children with disabilities are eight times less likely to be in school than learners without disabilities [↑UNESCO's \(2023, p. 22\)](#). Many of these inequalities have been exacerbated further by the Covid-19 pandemic, partly due to a lack of access to suitable software and support ([↑UNSDG, 2020](#)). In Timor-Leste, the non-governmental organisation Belun estimates that less than half of youth with disabilities have ever attended school, which is half the rate of their peers without disabilities ([↑UN Timor-Leste & Belun, 2018](#)). Of those who do attend school, the report states that two-thirds of youth with disabilities drop out of school by the time they reach secondary education. A lack of infrastructure, materials, necessary teacher skills, and family beliefs are some of the reasons for this high dropout rate.

In relation to hearing impairments specifically, the World Health Organization ([↑WHO, 2021](#)) reports that more than 400 million people in Southeast Asia have hearing loss. WHO also estimates that every year about 38,000 deaf children are born in Southeast Asia ([↑WHO, 2005](#)). In

2023, the WHO declared that of the 2.2 billion people with a visual impairment worldwide, 30% live in Southeast Asia ([↑Sharma, 2023](#)), while studies found that in 2020, an estimated 283,151 children in South East Asia were blind ([↑Teoh et al., 2022](#)).

Assistive technology and information and communications technology (ICT) have been championed as ways to meet the educational needs of learners with SEND and create a more inclusive learning environment ([↑Hata et al., 2023](#); [↑Lynch et al., 2022](#); [↑UNESCO, 2020; 2023](#)). This potential is being recognised in Southeast Asia, and many countries are developing assistive technologies ([↑UNESCO, 2023](#)). However, implementation challenges remain, such as a lack of infrastructure, cost, and the small scale of projects ([↑UNESCO, 2020; 2023](#)). For example, funding in Indonesia is inadequate to allow specialist schools for learners with SEND to buy assistive technology ([↑Hata et al., 2023](#)). Further challenges arise when considering the difficulties of meeting individual learners' needs ([↑Lynch et al., 2022](#)). Indeed, teachers sometimes lack the necessary training to provide learners with personalised learning through technology ([↑UNESCO, 2020](#)). While these issues exist, the full potential of educational technology to aid learners with disabilities will not be realised.

1.2. Research questions

Two research questions guide this review:

- What are the key emergent themes in the available literature on the use of technology for the education of learners with visual and hearing impairments in Southeast Asia?
- What are the key learnings and recommendations that can be drawn from the available literature to promote a better quality of education for learners with visual and hearing impairments in Southeast Asia?

1.3. Definition and scope of the review

For the purposes of this review, we adopted the following key definitions:

Southeast Asia: Countries that are member states of The Association of Southeast Asian Nations (ASEAN). These are Brunei Darussalam ('Brunei'), the Kingdom of Cambodia ('Cambodia'), the Republic of Indonesia ('Indonesia'), the Lao People's Democratic Republic ('Laos'), Malaysia, the Republic of the Philippines ('the Philippines'), the Republic of Singapore ('Singapore'), the Kingdom of Thailand ('Thailand'), the Democratic Republic of Timor-Leste ('Timor-Leste'), the Union of Myanmar ('Myanmar'),

and the Socialist Republic of Viet Nam ('Vietnam'). Timor-Leste has also been included in this category based on its pending membership of ASEAN. All the countries identified above are member countries of the Southeast Asia Ministers of Education Organization (SEAMEO).

EdTech: Educational technology. “Technologies — including hardware, software, and digital content — that are either designed or appropriated for educational purposes.” (↑[Hennessy et al., 2021](#), p. 8)

Assistive technology: In educational settings, assistive technology devices include equipment that provides support for learners with disabilities to “increase, maintain, or improve their functional capabilities” (↑[Disability Rights Washington, no date](#)).

Both EdTech and assistive technology can be categorised into low-tech, mid-tech, and high-tech (↑[UNESCO & SEAMEO Regional Centre for Special Educational Needs, 2023](#)). Low-tech does not typically involve specialised software, while high-tech uses technology to meet the particular needs of individual learners. For example, pencil grips and canes are considered low-tech, while text-to-speech software and hearing aids are classified as high-tech.

Disability and visual and hearing impairments: Article 1 of the Convention on the Rights of Persons with Disabilities defines persons with disabilities as

“those who have long-term physical, mental, intellectual or sensory impairments which in interaction with various barriers may hinder their full and effective participation in society on an equal basis with others.” (↑[United Nations, 2006](#))

The EdTech Hub series of RERs on Southeast Asia includes two on SEND. The focus of this review is hearing and visual impairments. As discussed by ↑[Lynch et al. \(2022\)](#), it is difficult to define disability due to its multidimensional nature. However, for this RER we use the definition of a hearing impairment as a “partial or total inability to hear” and of visual impairment as requiring materials such as braille and audio resources to learn, above and beyond needing basic corrective glasses (↑[Daramola et al., 2019](#), p. 1490; ↑[Kızılaslan, 2020](#), p. 82).

1.4. Theme identification

A systematic search for evidence on the use of EdTech for learners with SEND was conducted. More detail on that process, including the inclusion and exclusion criteria, is provided in [Section 1.6](#). Once all of the screening

was completed, we then divided the selected papers into two groups. Papers focusing purely on visual and hearing impairments (22) are covered in this review, while the rest of the resources relevant to other types of disability are discussed in the RER focusing on cognitive and learning disabilities (see [↑Mitchel et al., 2024](#)).

Following a thematic analysis of the papers on visual and hearing impairments, we classified these into three themes and sub-themes. The themes are discussed in depth in [Section 2](#) and, are:

- Nature of EdTech for learners with visual and hearing impairments
- Effectiveness / facilitating factors of EdTech
- Barriers of EdTech

1.5. Structure of the RER

In [Section 1.6](#) we discuss the methodological approach, including details of the literature search and eligibility criteria. [Section 1.7](#) outlines the possible limitations of the methodology. [Section 2](#) presents detailed findings under the separate themes that emerged from a thematic analysis of the identified literature. [Section 3](#) concludes the report and provides a synthesis of the findings from the literature.

1.6. Methodology

The methodological approach is informed by the Cochrane Collaboration Rapid Reviews Methods Group interim guidance on producing rapid reviews ([↑Garritty et al., 2021](#)). This permits a rigorous and systematic approach while defining the scope narrowly enough so that it can be completed within a short span of time.

While the intention was to model this RER on a systematic, thematic review of primary studies, it quickly became apparent that there are significant evidence gaps on this topic, particularly in terms of rigorous, quality evaluations or impact studies. Consequently, we decided to include reviews of other literature or systematic reviews.²

The research process therefore comprised a systematic sequence of searching and screening. After the research questions and inclusion

² [↑Higgins et al. \(2023\)](#) distinguish a systematic review thus: “Systematic reviews seek to collate evidence that fits pre-specified eligibility criteria in order to answer a specific research question. They aim to minimize bias by using explicit, systematic methods documented in advance with a protocol.”

criteria had been defined, keywords were combined into comprehensive search strings (see [Annex A](#)), which were then input into Google Scholar. The search results were then screened according to the inclusion criteria, first based on paper titles and abstracts and then on full content.

1.6.1. Literature search

Google Scholar constituted the primary source of literature. [Figure 1](#) below details the process used to arrive at the articles that were ultimately analysed thematically for this review. It is important to highlight that unlike a more traditional systematic review process, which may screen all search results, the rapid review methodology used here relied on a system of quotas. As such, only the most relevant results (up to a maximum of 500), as ranked by Google Scholar, were selected for the first round of screening. Four hundred articles were initially captured for further screening.

These results were not screened and ranked for quality or limited to peer-reviewed / academic publications. Relying solely on peer-reviewed academic articles would have resulted in a narrower, less generalisable review. Crucially, this would also have excluded a more significant number of voices from low- and middle-income countries due to the systemic factors that exclude many academic researchers in low- and middle-income countries from mainstream peer-reviewed journals.

1.6.2. Screening and eligibility criteria

The title and abstract screening, as well as all subsequent screenings, were conducted according to the eligibility criteria presented in [Table 1](#) below.

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

Criterion type	Inclusion criteria
Focus demographic	Learners with SEND
Education level	Pre-school, primary, secondary, tertiary
Geography	Southeast Asian countries
Literature type	All
Date range	2009–2024

One limitation of relying on Google Scholar as the primary source of literature was the number of low-quality papers collected. While the title and abstract may have demonstrated the necessary relevance to be captured initially, the substantive content often proved to be of low quality. These were therefore filtered out only after the full text had been read.

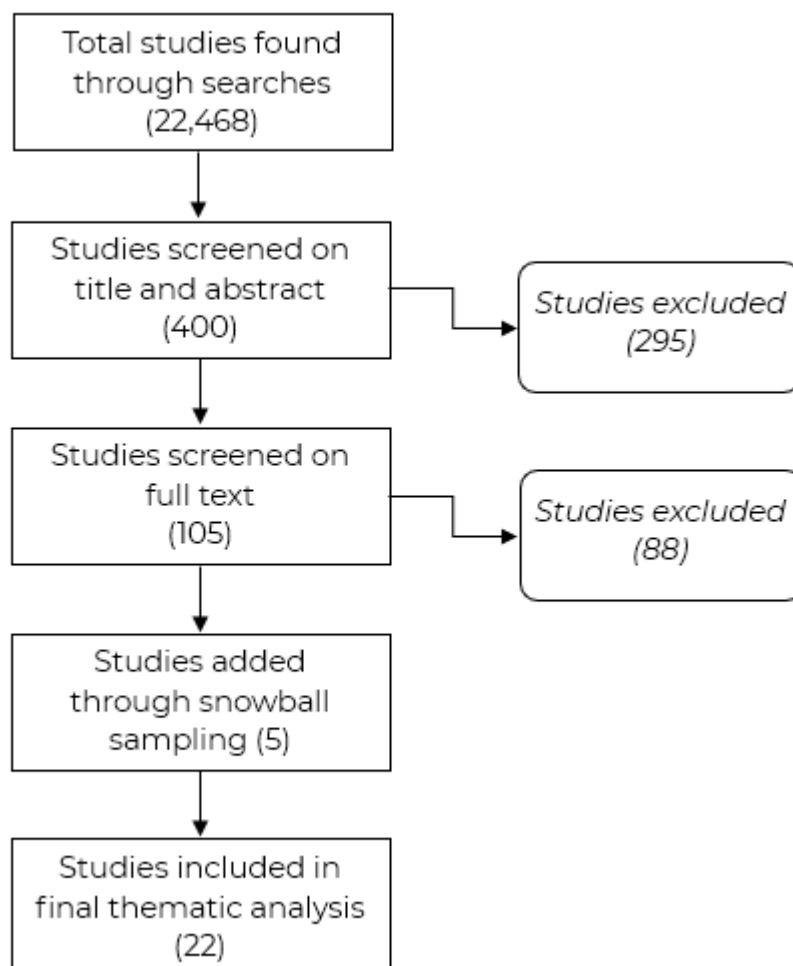
Additionally, search strings for screening relevant literature included the term “ASEAN” for the countries in this review that are ASEAN member states. However, separate searches were conducted for literature on Timor-Leste as it is not currently part of ASEAN (although it has applied for membership).

Other methods were also used to search for relevant literature, such as snowball sampling searches. While the main thrust of the literature review involved a highly systematic approach, we recognised that there might be influential literature not captured through those searches alone. Therefore, the reference lists of the most relevant papers which the systematic literature review surfaced were searched for additional resources. In addition, given the scarcity of empirical studies that met the inclusion criteria, we decided to include non-academic sources that provided information on the nature of relevant EdTech interventions for learners with SEND in the region. An example is the Eskola Ba Uma project in Timor-Leste ([↑The Convention Centre of Dili \(CCD\), 2020](#)).

[Figure 1](#) presents the total number of papers included and excluded in each stage. Please note that the initial total number of papers screened included studies on disabilities other than visual and hearing impairments,

and the number of papers after full-text review reflects studies on visual and hearing impairments only.

Figure 1. Literature search and screening process



1.7. Limitations

The restricted time frame and nature of the available evidence resulted in limitations, which are highlighted below:

1.7.1. Data availability and methodological rigour

This review highlights a research gap in the evidence base on EdTech and SEND education in Southeast Asia. The research gaps are also more apparent for some countries than others. For example, a large proportion of the literature selected for this RER concerns Indonesia, while suitable literature was not found for other countries, such as Singapore and Brunei. There are initiatives in the latter countries, but the data available for them is not presented in a format that met our inclusion criteria (e.g., web

pages).³ Relatedly, much of the literature examined evaluates an example of EdTech in one specific setting in one country. This means that the discussion does not apply to Southeast Asia as a whole, and this gap in country data further highlights the need for more research. In addition, some of the methodologies lacked rigour, and the reports were of poor quality. Most of the literature also lacked detailed case studies, thus limiting the number of such discussions in the analysis section of this RER. Furthermore, due to the academic nature of publications on Google Scholar, the available literature mainly concerns the viewpoints of teachers, learners, parents, and policymakers. This means that information from other stakeholders, such as technologists and NGOs, which tends to be found in grey literature, is beyond the scope of the RER.

1.7.2. Search and inclusion strategy

An inherent limitation of the RER is that the search and inclusion strategy is not, by design, exhaustive. Therefore, it is possible that not all relevant literature was located and included. Additionally, the search for literature on Timor-Leste differed from the other countries, meaning there may be literature gaps that could have been filled had Timor-Leste been included in the search strings.

³ Some initiatives that were not incorporated into this review due to the type of documentation available, one example is *Let's Read*. <https://www.letsreadasia.org/>. Retrieved 14 July 2024.

2. Systematic review and thematic analysis

This section covers the primary analysis and synthesis of the literature surfaced through the search, discovery, and screening process. We present the findings in three themes, with analytical categories discussing recurring topics in each theme.

2.1. Nature of EdTech

The literature discusses the EdTech developed for learners with visual and hearing impairments in Southeast Asia. Nevertheless, in general, data and interventions in this region remain limited. Some of the literature indicates that, historically, traditional teaching methods, such as flashcards, have been used to teach learners with disabilities ([Masitry et al., 2013](#)). During the Covid-19 pandemic, the need for distance learning resulted in a shift in teaching and learning methods, including an increased use of EdTech ([Musayaroh et al., 2023](#); [Sholikhati et al., 2021](#)). Unfortunately, the use and impact of many pandemic interventions is unclear due to the limited information available. For example, in Laos, the Khang Panya Lao ('Lao Wisdom Warehouse') programme distributed tablets with accessibility options that could support learners with SEND ([UNICEF Lao Country Office, 2022](#)). However, their use and impact have not been evaluated to date.

2.1.1. Visual impairments

Examples of device innovations for learners with visual impairments were identified within the literature. These examples often centre around the use of braille and audio content.

Countries such as the Philippines, Indonesia, Thailand, and Timor-Leste have recently made efforts to develop easy-to-use devices for teaching braille and providing digital literacy classes for learners with visual impairments.

In the Philippines, for example, an interactive braille pegboard has been developed ([Lopez MASc et al., 2019](#)). The pegboard has four braille cells for learners to begin learning four-letter words in both English and Tagalog. The device provides auditory feedback to the learner depending on their answers. Furthermore, in Indonesia, a digital 'braille corner' model was proposed to teach digital braille literacy skills ([Suherman et al., 2022](#)). Qualitative data from focus group discussions with university students with

visual impairments were used to validate the model, showing that continued training (for example, learners are paired with mentors to help them through the learning process) and technical support (for example, a digital braille system that converts text on the screen to braille) allow learners with visual impairments to use conventional computers.

In Thailand, assistive technology is present in schools for learners with visual impairments ([Lersilp et al., 2018](#)). However, this primarily consists of low- and mid-tech solutions such as brailers, magnifiers, slates, and styluses. Similarly, in Dili, in Timor-Leste, braille keyboards, among other ICT equipment, have been provided by all but one special school since 2014 to meet the needs of learners with visual impairments ([UNESCO & SEAMEO Regional Centre for Quality Improvement, 2023](#)). Countries like Indonesia and Timor-Leste have also incorporated audio content to support learners with visual disabilities. For example, in their study at a school in Indonesia, [Noor & Sugiantiningsih \(2022\)](#) discuss the importance of audio in teaching learners with visual impairments. In addition, as part of the Eskola Ba Uma ('School goes home') distance learning initiative in Timor-Leste, an online Learning Passport platform was developed where learners with visual impairments could access content via radio or audio-only format ([UNICEF Timor-Leste, 2020](#)).

2.1.2. Hearing impairments

The literature indicates that various solutions have been used for learners with hearing impairments. For example, in Thailand, schools have learners who use hearing aids or have cochlear implants, and some schools have sign language interpreters ([Lersilp et al., 2018](#)). In Malaysia, [Krishnan et al. \(2020\)](#) discuss the use of hearing aids by culinary students alongside video communication technologies such as Zoom and Skype.

The literature also discusses multimedia software developed for learners with hearing impairments. In this RER, the term multimedia is used when the literature itself has described the technology in this way or when the technology utilises different forms of media, such as pictures, videos, and captions. In Thailand, multimedia software — defined by the authors as a “combination of text, graphics, animations, sound, and video” — has been designed and tested to teach mathematics to 7-year-old learners with hearing impairments ([Techaraungrong et al., 2015](#), p. 216). In Malaysia, multimedia software featuring animation and videos with Malaysian Sign Language targeted preschool learners to help them learn basic numeracy and literacy ([Masitry et al., 2013](#)). Multimedia software is also used in non-traditional subjects, as demonstrated by the development of interactive multimedia flood prevention education in Indonesia

(↑[Robiansyah et al., 2019](#)). In Timor-Leste, the first national online learning platform was implemented as part of the Eskola Ba Uma distance learning initiative, and hearing-impaired learners could access video lessons with built-in sign language interpretation (↑[UNICEF Timor-Leste, 2020](#)).

The literature also discussed the creation of specific media to teach children languages. For example, in Thailand, an animated dictionary called the Total Communication with Animation Dictionary (TCAD) has been developed to teach primary school learners English as a second language (↑[Wicha et al., 2012](#)). Meanwhile, in Indonesia, BacaBicara, a website-based tool, was designed to teach both children and adults through lip-reading videos (↑[Muljono et al., 2019](#)). It includes a teacher's page should a teacher wish to monitor their learners' progress. The prototype was tested, and findings indicate that BacaBicara has the potential to improve learning.

Some of the literature focuses on distance learning, partly made necessary by the Covid-19 pandemic (↑[Sholikhati et al., 2021](#)). ↑[Noor & Sugiantiningsih \(2022\)](#) and ↑[Rahmawati et al. \(2022\)](#) consider the impact of the pandemic on learners with hearing impairments in Indonesia, including the technology used by the learners to enable distance learning. Another example in the literature is the use of inclusive e-modules to teach tertiary education management students with hearing impairments in Indonesia (↑[Musayaroh et al., 2023](#)). The authors suggest that the e-modules had a positive impact on learning outcomes. Furthermore, both ↑[Acain et al. \(2022\)](#) and ↑[Dianito et al. \(2021\)](#) explore the challenges faced by learners with disabilities in the Philippines during the Covid-19 pandemic. ↑[Dianito et al. \(2021\)](#) discuss disability more generally, including learners with hearing and visual impairments, while ↑[Acain et al. \(2022\)](#) focus on physical education for learners with hearing impairments.

Another example is the All Children Reading initiative (↑[USAID, 2023](#)), which was implemented in multiple countries, including several in Southeast Asia. In the Philippines specifically, the Reading Beyond Sight project introduced high-tech solutions such as desktop computers loaded with Zoomtext software, magnifying closed-circuit televisions (CCTVs) that enabled reading large-print text, and Digital Accessible Information System players.

In Vietnam, as part of the Quality Improvement of Primary Education for Deaf Children project (↑[World Bank, 2023](#)), 150 Vietnamese-Sign-Language-based animated videos covering the mathematics curriculum and Vietnamese language lessons from Grades 1 to 5 were developed and made available to deaf learners. This was

accompanied by a searchable video database of 4000 VSL lexicons specifically recorded for the same project.

2.2. Effectiveness / facilitating factors of EdTech

In addition to describing EdTech for learners with SEND, the literature also identified factors that may facilitate or impact the effectiveness of EdTech for SEND education.

2.2.1. Meeting the needs of the learner

Although perhaps a widely accepted argument, it should be noted that the technology implementers' preference for audio or visual components in EdTech varied across the case studies and was dependent on the learners' disabilities. For instance, for learners with hearing impairments, the software investigated is highly visual, including sign language interpretation, lip-reading, and captioning videos. Indeed, [↑Musayaroh et al. \(2023\)](#) argue that visual information allows learners to comprehend the content because sight is the dominant sense for those with hearing impairments. This belief is common across many of the interventions discussed in this RER. For instance, at one school in Malaysia, five teachers were surveyed regarding what they believed should be included in courseware for preschool learners with hearing impairments ([↑Masitry et al., 2013](#)). In their responses, all the teachers included visual elements, such as images, text, and animation.

Furthermore, [↑Techaraungrong et al. \(2015\)](#) discuss the importance of visual elements of multimedia to facilitate learning. In their study, they describe how their educational multimedia software to teach numeracy in Thailand prioritises images and numbers, restricting text to the title page. The images used are non-symbolic, such as objects found in typical households, making them recognisable and contextually appropriate for the learner. When learners complete addition and subtraction exercises, an index finger points to the images of the objects to highlight relevant information to the learner. The authors argue that using images and symbols in this intervention makes the multimedia shareable across contexts.

[↑Muljono et al. \(2019\)](#), [↑Robiansyah et al. \(2019\)](#) and [↑Wicha et al. \(2012\)](#) corroborate the above findings and describe the importance of incorporating visual elements in technology. For example, the TCAD includes components such as images of finger spelling and lip-reading videos ([↑Wicha et al., 2012](#)). Furthermore, in the TCAD, words are introduced

by animated characters; animation has been shown to be more effective than static images in teaching children ([↑Masitry et al., 2013](#)).

Although much of the literature discusses braille as a communication medium for learners with visual impairments, studies also show that audio could also be a helpful tool for these learners. According to one staff member at a school in Indonesia, voice messages and voice computers are used to meet the needs of visually impaired learners ([↑Noor & Sugiantiningsih, 2022](#)). In the Philippines, [↑Dianito et al. \(2021\)](#) quoted a blind learner who stated that a screen reader helped them to learn how to use applications like Zoom during distance learning during the Covid-19 pandemic. These examples emphasise the widely accepted idea that when technology considers the differentiated needs of learners with disabilities, it can become a facilitating factor for learning.

2.2.2. Ease of use and enjoyable learning

Unsurprisingly, evidence in the literature suggests that ease of use is an important facilitating factor for the success of EdTech for learners with visual and hearing impairments. [↑Lopez MASc et al., 2021](#) report that most participants in their study believed that the braille pegboard device was easy to use. Including clear instructions, engaging content, and ensuring the device had a simple and practical layout contributed to making the pegboard easy to use.

Many papers noted that learners enjoyed using multimedia software ([↑Masitry et al., 2013](#); [↑Robiansyah et al., 2019](#); [↑Techaraungrong et al., 2015](#); [↑Wicha et al., 2012](#)). In Thailand, learners using multimedia to learn mathematics remarked that the technology was both fun and easy to use ([↑Techaraungrong et al., 2015](#)). [↑Wicha et al., \(2012\)](#) report that the teachers discussed learners' enthusiasm when using the TCAD, although the authors acknowledge the need for further qualitative data to support the observation. Similarly, [↑Masitry et al. \(2013\)](#) state that teachers believed that the multimedia they used to teach preschool learners in Malaysia has made learning engaging. The learners reflected that they liked the multimedia design, including its use of colours. Here, the literature aligns with good practice on engaging learners and acknowledging learner preferences when developing EdTech.

2.2.3. Repeat learning and accessibility

The success of video media is partly attributable to its ability to repeat content. [↑Rahmawati et al. \(2022\)](#) found that introducing WhatsApp videos to learn maths increased learning opportunities for hearing-impaired learners because they could access and rewatch them anytime. Similarly,

↑Masitry et al. (2013) and ↑Techaraungrong et al. (2015) argue that videos allow learners to repeat content as often as needed if they do not understand the material the first time. The BacaBicara lip-reading videos in Indonesia take this a step further, with the website programmed to repeat a question when the learner gets an answer wrong (↑Muljono et al., 2019). Furthermore, provided there is access to the necessary devices and internet connection, videos can be watched in any location, including both at school and at home, allowing for increased accessibility to educational resources (↑Masitry et al., 2013; ↑Muljono et al., 2019).

2.2.4. Inclusivity

Evidence suggests that including learners with disabilities rather than separating them from other learners is beneficial to learning for all (↑Bulat & Hayes, 2017). ↑Musayaroh et al. (2023) explore this concept in a university in Indonesia. They identified the ability of an e-module with an inclusive design to meet the needs of all learners, including those with hearing impairments. Learning alongside their hearing peers did not prevent the hearing-impaired learners from improving their learning outcomes. Before using the e-module, the hearing-impaired learners scored 60 on a test; after using the e-module, their scores improved to 80, indicating that this intervention contributed to learning improvement for them.

2.2.5. Teacher communication

In their study in Indonesia, ↑Sholikhati et al. (2021) argue that communication between teachers and learners is vital during distance learning. However, it should be noted that the authors categorise disability as including physical impairment but do not specifically mention hearing or visual disabilities. Teachers being able to interact with both learners and parents via platforms like Zoom can facilitate good communication. Teachers can find it challenging to know how to accommodate learners' needs during distance learning without the support of parents (↑Rahmawati et al., 2022). Similarly, in the Philippines, communication is viewed as vital for facilitating online learning (↑Dianito et al., 2021). Indeed, one learner noted the importance of being able to communicate their needs to their teacher. Since this literature mainly focuses on technologies specifically designed for communication, such as video calling platforms, further research should look into how learner–teacher communication could be embedded into the other types of EdTech being used in the region.

2.3. Barriers of EdTech

Despite the potential of EdTech to meet the needs of learners with visual and hearing impairments in Southeast Asia, implementation challenges remain ([↑UNESCO & SEAMEO Regional Centre for Special Educational Needs, 2023](#)).

2.3.1. Infrastructure

Difficulties accessing a quality internet connection is one of the more commonly mentioned infrastructural challenges in the literature. [↑Acain et al. \(2022\)](#) focus on the barriers hearing-impaired learners encounter when engaging in distance physical education in the Philippines. One of the key barriers identified is having a slow internet connection, meaning learners may find it difficult to access physical education remotely. The authors also state that some people may be unable to afford the required internet connection, implying that cost and lack of infrastructure can be a combined issue for learners.

These findings are corroborated by a further study in the Philippines ([↑Dianito et al., 2021](#)). The participants, some of whom have visual and hearing impairments, were asked about challenges they faced during online learning as a result of the Covid-19 pandemic. The most common answers related to the limitations of assistive technology and problems with internet connectivity. One blind learner was concerned about the internet disconnecting while their teacher was talking. Without alternative means, such as written or on-screen notes, which are available to their sighted peers, visually impaired learners are disadvantaged even when they can access online education. These examples highlight how learners with disabilities, who are already marginalised in terms of education access, may face further difficulties when they are dependent on access via the internet.

A teacher in [↑Noor & Sugiantiningsih's \(2022\)](#) study also voiced their concern about families being unable to afford the internet. These concerns are consistent with country-level data that shows that the cost of ICT is often high in some countries, such as Timor-Leste and Laos, where the cost of entry-level broadband services exceeds the Sustainable Development 2025 target of not more than 2% of monthly GNI per capita ([↑ITU, no date; 2021, p. 23](#)). Moreover, there are concerns in Malaysia about learners not being able to afford devices such as smartphones ([↑Krishnan et al., 2020](#)). The cost and lack of familiarity with using online tools prevent learners from using software like Skype and Zoom to learn. These concerns further

highlight the potential for technology to reinforce barriers for already marginalised learners.

In Indonesia, [↑Suherman et al. \(2022\)](#) suggest that the EdTech industry typically targets users with high digital literacy and purchasing power, while learners with visual impairments are largely ignored. Other barriers mentioned include the scarcity of suitable learning content, the high cost of developing technology that supports digital literacy skills (e.g., screen readers), and institutional barriers ranging from learners not meeting school entry requirements to large class sizes.

2.3.2. Hardware-related considerations

In addition to issues with infrastructure, some learners face problems with hardware. Sometimes, difficulties arise through a lack of mutual understanding between learners with SEND and their peers. Communication issues were reported in the case of the inclusive e-module mentioned above, which allows learners with hearing impairments to learn alongside their peers ([↑Musayaroh et al., 2023](#)). Hearing-impaired learners may rely on lip-reading, but their peers do not always have the camera switched on, preventing the former from following lesson discussions. As mentioned above, learners with disabilities are already marginalised, and the interaction with other learners can exacerbate existing challenges further.

In contrast, the physical devices themselves, rather than the users, may be the source of issues. For instance, some learners reported that the braille pegboard was too heavy to manipulate ([↑Lopez MASc et al., 2021](#)). Technology designers must consider the practicalities of a tool beyond how it adapts to a learner's disability.

2.3.3. Intersectionality and lack of personalisation

The personalised and intersectional nature of disabilities means that different learners with hearing impairments will potentially benefit from EdTech to differing degrees. [↑Musayaroh et al. \(2023\)](#) emphasise the importance of personalising learning to meet learners' individual needs. [↑Lersilp et al. \(2018\)](#) corroborate this in their study of learners with different types of disability at SEND schools. They find that not all learners need all of the assistive technology available, and that much depends on the type of disability. Moreover, [↑Rahmawati et al. \(2022\)](#) discuss how some learners using videos for distance learning were not only deaf but also had other obstacles, such as learning disabilities, which prevented them from understanding the content. The intersection of multiple disabilities presents unique challenges to the education system. The presence of

multiple types of disabilities in one classroom, sometimes affecting the same learner, undermines the capacity of a single modality of teaching to meet the needs of all learners equitably. For example, the literature reviewed for this RER does not discuss initiatives for learners with both hearing and visual impairments. Multiple disabilities challenge teachers to meet all learners' needs, highlighting the importance of teacher training in personalising learning and suitable EdTech.

2.3.4. Contextual barriers

Using sign language can also be complex in some contexts; in Thailand, several different forms of Thai sign language exist (e.g., standard versus indigenous), leading to communication issues when users of different forms attempt to converse ([↑Schiemer et al., 2013](#)). Technology must be context-appropriate, alongside meeting the specific needs of a learner's disability.

3. Synthesis and conclusion

This section synthesises the themes and subthemes covered in this rapid review, highlighting the key takeaways from the main discussions in the previous section.

Key Takeaway 1

Additional research and data are needed across Southeast Asia to understand how learners with visual and hearing impairments learn, what works, and what additional support is needed. The need for further research and data is especially pertinent when we consider multiple dimensions of marginalisation (e.g., different types of SEND, girls and SEND, rural locales and SEND, etc.) and the complex ways in which these intersections affect learners' access, learning experiences, educational outcomes, and needs. More research (both researcher-led and commissioned) is required to investigate the intersectional nature of disability and to ensure that the future evidence base covers all individuals.

There is also little in the identified literature on teacher training to support and accommodate learners with visual and hearing impairments, as well as teacher attitudes towards teaching learners with SEND. It is, therefore, vital to embed training for teaching learners with disabilities in pre- and in-service teacher training. Teaching in classrooms with diverse needs requires a complex skill set and a high level of competency, so it is crucial to provide teachers ongoing support to, in turn, support all learners effectively. Additionally, because a teacher's commitment to meeting these varied needs correlates with learning outcomes for learners with disabilities, efforts to cultivate a culture of inclusivity where all learners are supported equitably are crucial. One way forward is ensuring relevant teacher training is well-integrated into professional development plans so that educators and systems alike view it as a core part of teacher responsibilities rather than an add-on. Training should be led by the needs of both learners and teachers, and should incorporate previous feedback from teachers on the best ways to conduct teacher training.

Relatedly, the ability of caregivers to support their children is a key component of learning. However, literature on how the use of EdTech devices or interventions in school or public settings may extend to a home setting was scarce. Likewise, there was little literature on how caregivers can receive further training to support their children with visual and hearing impairments. Because digital literacy levels among adults vary widely across the region, further research in this area would likely benefit

policies and programmes that seek to fully support the learning and growth of learners with visual or hearing disabilities. Such research would make it possible to develop tailored advice for caregivers to support their children.

Our review highlighted that there was also minimal literature on the socio-emotional impact of being a learner with a visual or hearing impairment in Southeast Asia. More information is needed to understand the socio-emotional health and development of these learners and how EdTech may help or hinder their development in this area. This information should be incorporated into training for both teachers and caregivers to ensure that they know how to ensure the socio-emotional well-being of their learners.

Beyond socio-emotional outcomes, more data is needed on the cost-effectiveness and quality of EdTech interventions to establish guidelines for educators and caregivers. This data should also include how long an intervention is expected to last. Data on cost-effectiveness would allow decision-makers at national, regional, and local levels to make informed decisions on the suitable policies and interventions to implement and for how long. Cost-effectiveness research should include the cost of training teachers to ensure that their professional development is considered at every stage of policymaking. It is also essential to prioritise the quality of interventions to ensure that EdTech is not selected purely based on cost considerations but, more importantly, on its effectiveness relative to cost.

Key Takeaway 2

Practices that support learning for learners with disabilities can support all learners, and governments should provide these accommodations along with appropriate teacher training to ensure all staff are invested in these practices. While some accommodations are specific to visual or hearing impairments (e.g., the use of braille or screen readers), many others would benefit all learners, including those with cognitive and other types of disabilities. Rather than viewed as an add-on, investment in assistive technology should be considered as an integral part of the education system. Examples include captioning, visual elements and guides, built-in options for repeating content, and generally improved ease of use of devices, applications, and digital programmes. These interventions should be piloted in inclusive and SEND education settings to ensure that they meet the needs of all learners.

We also observed that many EdTech interventions focus on being learner-centred — that is, easy to use and fun. It is important to pilot any intervention on its target audience so that evidence can be collected on how easy to use and enjoyable certain features are for different learners. Such evidence would allow informed decisions on how to make EdTech engaging for learners with SEND.

Figure 2. *Impact of inclusive education on learners without SEND*

The positive effect of inclusive education on learners in different parts of the world, regardless of whether they have SEND, has been documented in existing literature.

According to ↑Kart & Kart (2021), the academic effects of inclusion on learners without disabilities are mixed — neutral or positive when in lower grades but switching to neutral or negative in higher grades. However, the social effects are mainly positive — a decrease in discrimination can be seen in the literature.

In the Netherlands, ↑Ruijs et al. (2010) found no significant difference in the academic performance of learners without SEND in both inclusive and non-inclusive classes. The findings also suggest that the results are not affected by learners' intelligence levels or the number of learners with SEND in an inclusive classroom. The authors believe these findings reinforce the argument for inclusive education, as it does not appear to adversely affect learners without SEND. Although these results are from a high-income context, they raise important questions about the impact of inclusive education on learners without SEND in other regions.

Key Takeaway 3

Some of the barriers identified were not unique to learners with visual or hearing disabilities, and were instead relevant to the general use of EdTech in that context. Strengthening a country's ICT and EdTech infrastructure and ensuring, for example, that services are not only available but also affordable will benefit all learners, particularly those from a marginalised background. Additionally, all learners require appropriate hardware that will allow them to access the requisite materials. In resource-constrained contexts, governments may wish to first identify interventions that will have the greatest impact on the broadest number of marginalised learners, and then design and implement more targeted interventions to ensure that the needs of all remaining learners are met. This should be done at a cost governments can sustain, as determined by cost-effectiveness and other forms of budgetary analysis.

Furthermore, understanding the intersectional nature of disabilities is vital. Appropriate personalisation can be an excellent way to maximise the impact of technology by considering multiple disabilities in the design of EdTech interventions. Learners without disabilities who face similar

individual or structural struggles will thus also benefit from these considerations. Each prospective intervention should be examined and piloted to determine how far it caters to different learner needs.

Figure 3. *Intersectionality and inclusive education of learners with SEND*

Intersectionality is often forgotten when considering a learner's educational needs. This has been discussed in some literature from around the world.

For many learners with SEND, their disabilities are only part of their identity. Through the lens of intersectionality, researchers have shown how a combination of multiple SEND, SEND and gender, or SEND and displacement poses a much more complicated picture in education research and practice.

†Nguyen & Mitchell (2014) highlighted that in Vietnam, girls with disabilities do not receive attention from the government and policymakers despite awareness about the education rights of girls in general. This neglect could be attributed to mainstream discourses about disability and education being problematically grounded in an ableist ideology. As a result, girls with disabilities have been much more disadvantaged than boys with disabilities and more disadvantaged than girls without disabilities in terms of opportunities and access to education.

†Bacakova et al. (2023) examine the reports from the UN Committee on the Rights of Persons with Disabilities (CRPD Committee) and similarly argue that the intersectional nature of refugee education and SEND makes refugees with SEND face severe inequality in their rights to education in various countries. The authors note that the only countries mentioned regarding the lack of inclusive education for refugees with disabilities are France and Greece, demonstrating how neglected this topic has been. Physical inaccessibility of school facilities, inadequate teacher training and a lack of assistive devices still pose huge challenges for these learners on a global scale.

Key Takeaway 4

Having the appropriate hardware alone is insufficient for meeting the needs of learners with disabilities; all learners need to learn how to create inclusive environments for each other in the classroom, including considering the needs of learners with disabilities. Some of the resources required by learners with disabilities need to be provided by schools and education systems. However, for these materials to deliver the intended support, every learner in a school or classroom must learn how to appropriately access materials, why it is important to do so, and identify ways they can proactively consider to include their peers with visual or hearing impairments. For example, if computers include cameras so that learners who rely on visual cues can use them for lip-reading, their classmates must learn to turn the cameras on, check that their faces are centred, and the camera is in focus. Understanding the rationale for these actions will also help learners identify gaps in the current process and

remedy or raise them. Ways to achieve this could include having lessons on inclusivity and the importance of helping their peers, possibly as part of relevant school curricula (e.g., social and emotional learning). Teachers may need to stress inclusivity to learners on a regular basis in order to ensure all learners consider the needs of others without being prompted.

Key Takeaway 5

There may be further opportunities for governments and educators to embed established principles for supporting learners with disabilities into their practice. In some instances, we observed the incorporation of good practices or principles for learners with disabilities, such as taking an inclusive education approach. Governments should conduct an analysis of where these practices could be further embedded, and may also consider how their regional counterparts are adopting these practices. We also recommend that ministries of education undertake further research into which practices work in their respective local contexts and how to incorporate them into policies so that they are enacted in education settings. These decisions should be made with stakeholders in the education sector in mind, such as teachers and caregivers, and should also be culturally appropriate. Based on the available literature, we suggest further analysis to identify potential gaps and additional ways of incorporating these approaches into policy and practice across the region.

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Annex A. Search strings

- ("Educational technology" OR "Education technology" OR EdTech OR "distance learning" OR ICT) AND (SEND OR "special needs" OR CWD or disabilit* OR "learning needs" OR disable*) AND (Brunei* OR Vietnam* OR Cambodia* OR Indonesia* OR Lao* OR Malaysia* OR Myanmar* OR Burma OR Philippines OR Singapore* OR Thailand OR "ASEAN" OR "South-east Asia")
- ("Education technology" OR EdTech OR "distance learning") AND (SEND OR "special needs" OR CWD or disabilit* OR disable*) AND (Brunei OR Vietnam OR Cambodia OR Indonesia OR Lao* OR Malaysia OR Myanmar* OR Burma OR Philippines OR Singapore OR Thailand)
- ("Education technology" OR EdTech OR "distance learning") AND (SEND OR "special needs" OR disabilit* OR "learning needs" OR disable*) AND (Vietnam OR Cambodia OR Indonesia OR Lao* OR Malaysia OR Burma OR Philippines OR Singapore OR Thailand OR "ASEAN")