

ALL CHILDREN READING:

A GRAND CHALLENGE
FOR DEVELOPMENT

Create a World of Deaf Readers

Standards for Sign
Language Storybooks

ABOUT THIS DOCUMENT

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Acronyms

<p style="text-align: center;">ACR GCD All Children Reading: Grand Challenge Development</p>				
<p style="text-align: center;">ADE Adobe Digital Editions</p>	<p style="text-align: center;">ASL American Sign Language</p>	<p style="text-align: center;">CC Creative Commons</p>	<p style="text-align: center;">CRPD Convention on the Rights of Persons with Disabilities</p>	<p style="text-align: center;">DAISY Digital Accessible Information System</p>
<p style="text-align: center;">DPO Disabled Persons' Organization</p>	<p style="text-align: center;">EPUB Electronic Publication</p>	<p style="text-align: center;">FPS Frames per second</p>	<p style="text-align: center;">HD High Definition</p>	<p style="text-align: center;">IS International Sign</p>
<p style="text-align: center;">LMIC Low to middle income countries</p>	<p style="text-align: center;">NGO Non-governmental organization</p>	<p style="text-align: center;">NTID National Technical Institute for the Deaf</p>	<p style="text-align: center;">PDF Portable Document Format</p>	<p style="text-align: center;">QA Quality Assurance</p>
<p style="text-align: center;">RIT Rochester Institute of Technology</p>	<p style="text-align: center;">SL Sign Language</p>	<p style="text-align: center;">STEM Science, Technology, Engineering and Mathematics</p>	<p style="text-align: center;">USAID United States Agency for International Development</p>	<p style="text-align: center;">UN United Nations</p>
<p style="text-align: center;">UNICEF United Nations International Children's Emergency Fund</p>	<p style="text-align: center;">VL2 Visual Language and Visual Learning</p>	<p style="text-align: center;">WASLI World Association of Sign Language Interpreters</p>	<p style="text-align: center;">WCAG Web Content Accessibility Guidelines</p>	<p style="text-align: center;">WFD World Federation of the Deaf</p>

Introduction



Credit:
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Creating a World of Deaf Readers

Literacy leads to better health, broadens employment opportunities, and creates safer and more stable societies. However, more than 387 million children are not expected to read or do basic math by the end of primary school (UNESCO Institute of Statistics, 2018). For the more than 93 million children with disabilities globally, learning outcomes are even lower, as they are less likely to go to school and have access to accessible learning resources. Building on a child’s language foundation, books pave the way for future success in life. Despite the importance of books in learning to read, there is a global shortage of accessible books available for children who are deaf. The severe shortage these children encounter is known as the “book gap.”

ABOUT THIS DOCUMENT

Rapidly changing technologies now allow for the easy creation of sign language storybooks to promote language and academic development for deaf children and youth worldwide, their families, caregivers, communities, and friends.

RIT/NTID, with support from ACR GCD, created the standards detailed in this document to spur the development of high quality sign language storybooks that address this “book gap” and ultimately *enhance literacy learning for children with disabilities.*

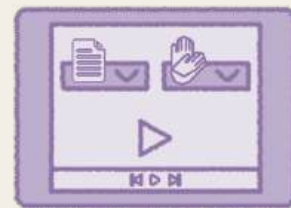
Additional resources that complement these standards are available including:



YouTube training videos for each lesson presented in sign language and/or with closed captions.



Signed Reference Guide on World Around You (WAY) Platform - an electronic publication (EPUB) presented in International Sign with English captions. This EPUB is open source and can be translated to other sign or written languages. More information is provided in the *Standards for Sign Language Storybooks: Additional Formats* section.



Signed Reference Guide on YouTube - presented in International Sign with English captions. To translate the videos into another language, see the *Standards for Sign Language Storybooks: Additional Formats* section.

¹ Deaf: The term deaf is meant to be an umbrella term including people who may identify as deaf, deafblind (a person who is deaf and blind), deafdisabled (a person who is deaf and has an additional disability such as Autism, intellectual disability, wheelchair user, etc.), hard of hearing, late-deafened, and other terms used in the local context. The intent is to recognize the shared experiences within the deaf community while also honoring differences.

ABOUT THIS DOCUMENT

The authors chose the title, “Creating a World of Deaf Readers” to signify the importance of language and literacy learning for deaf children. It also expresses a vision that all children around the world who are deaf will have the opportunity to become fluent in their sign language and written language through storybooks and ultimately become readers. By becoming fluent signers and readers, children who are deaf can reach their full potential and make their unique contribution to the world.

About the Authors



Rochester Institute of Technology/ National Technical Institute for the Deaf (RIT/NTID)

As one of the nine colleges of Rochester Institute of Technology in Rochester, New York, USA, National Technical Institute for the Deaf (NTID) is the first and largest technological college in the world for deaf and hard-of-hearing students. As of this writing, NTID serves more than 1,100 deaf and hard-of-hearing students from around the United States and from the world who live, study, and work alongside hearing students on the mainstream RIT campus. The authors of this guideline work for the Master of Science in Secondary Education for Students Who Are Deaf or Hard-of-Hearing (MSSE). MSSE has faculty with expertise in multilingual deaf education for early childhood education and P-12 grade levels.



All Children Reading: A Grand Challenge for Development (ACR GCD)

Launched in 2011, ACR GCD is a partnership of the United States Agency for International Development (USAID), World Vision, and the Australian Government that advances EdTech innovation and research to improve reading outcomes for marginalized children in low-resource contexts.

ACR GCD conducted a series of competitions, including Sign on For Literacy, Begin with Books, Ready2Read, and Sign Language Books in Action, that sought EdTech solutions to address barriers or gaps impacting language and literacy outcomes of children with disabilities. ACR GCD invested over \$2.5 million and made 17 awards to 10 innovators and local deaf led, disabled persons organizations (DPOs) to support the development and adoption of technology-based solutions to improve language and literacy outcomes for children who are deaf or hard of hearing in low-resource contexts. This included driving the development and use of over 350 free, open source video based story books in nine underserved local sign languages and available on multiple digital library platforms that are free and accessible to young learners.



Sign Languages

Sign languages (SLs) are natural, full-fledged languages with their own complex structures that are distinct from spoken languages (World Federation of the Deaf, 2018). They are not merely a communication tool. Direct spoken/written-word-to-signed-word translations are not possible. The vast majority of sign languages have dialects that are geographical-, generational-, gender-, ethnic-, and socioeconomic-based. Acknowledging deaf signers of diverse gender, racial, ethnic, cultural, linguistic, and socioeconomic backgrounds, and recognizing their language resources, linguistic creativity, and cultural funds of knowledge and skills are important assets of diverse sign language communities. Language and culture are so intertwined that a particular sign language points out to a specific cultural group of deaf people as the language has been used by the group. When you interact with the sign language, you are also interacting with the culture that uses the language. To understand one's culture, you need to interact with them through their sign language. Deaf children must interact with their languages, including sign language, to acquire the cultures, including deaf culture and local culture.

While affirming the United Nations' (UN) Convention on the Rights of Persons with Disabilities (CRPD's) recognition of sign language, language rights, and language accessibility, the World Federation of the Deaf (WFD) outlines the following human right instruments that support bilingual education:

- Salamanca Statement and Framework for Action on Special Needs Education addresses the right to receive education in a national sign language for deaf children:

ABOUT THIS DOCUMENT

Educational policies should take full account of individual differences and situations. The importance of sign language as the medium of communication among the deaf, for example, should be recognized and provision made to ensure that all deaf persons have access to education in their national sign language. Owing to the particular communication needs of deaf and deaf/blind persons, their education may be more suitably provided in special schools or special classes and units in mainstream schools.

UNESCO, 1994, p.18

- CRPD Article 24.3b ensures the right to learn sign language and promotes linguistic identity of the Deaf Community.

In response to multiple educational and technological issues, WFD has produced statements on sign languages:

Projects involving sign language work (production of sign language dictionaries and stories, sign language interpreter training, or sign language research) should actively include deaf people and the Deaf Community.

WFD Statement on Sign Language Work, 2014

Deaf children shall have full access to a quality education in their sign language(s), regardless of any technological devices they may use.

WFD Position Paper on the Language Rights of Deaf Children, 2016

The use of signing avatars may be novel, but live or prerecorded machine translations have yet to emulate human ability in conveying the message in terms of the lexicon (words/signed words), grammar (structure), semantics (meaning), and discourse (language use). Prerecorded avatars would require the inclusion of deaf people in advising on the appropriateness of the signed text. Current avatar models often lack one of the five sign language parameters,² especially nonmanual markers (facial expressions, body shifts, head tilts).

WFD and WASLI Statement on Use of Signing Avatars, 2018

Incorporating SL lexical, spatial, and grammatical features allows visual processing and language development.

² All sign languages share the five parameters that describe how a signed word is formed. The five parameters are handshape, location, movement, palm orientation, and nonmanual markers.

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Credit: USAID, Mission of Hope, Cabaret, Haiti

Language Development

The period from birth to age 8 is critical for the development of language and cognition for all children. Yet this period is often when deaf children are deprived of processes that promote healthy language development (Humphries et al. 2012, 2014, 2016). Recent evidence shows that profoundly deaf children possess high levels of language organization if they have early exposure to a visual language. According to these language development studies, children the world over develop language in basically the same stages. Currently, between 90 to 95 percent of deaf children are born to hearing parents. Unlike hearing children who have acquired a spoken language (e.g., Tagalog) through family and community interactions since birth, deaf children are more likely to have very limited communication with their hearing parents and other family members. Hearing people often have little to no exposure to or skills in sign language, face difficulty in communicating with their deaf children, and do not have the knowledge and skills to provide the early language exposure critical to a child's language acquisition. Instead, hearing parents often use spoken language and basic home gestures to communicate with their deaf child (Fobi et al., 2023; Humphries et al., 2022).



Credit: Deaf Child
Worldwide

Impact of Accessible Language in Deaf Children’s Education

Language is central to learning. While hearing children in low to middle income countries (LMIC) may struggle with literacy skills due to systemic factors, the situation for deaf children in these same countries is even more challenging. The majority struggle to access learning due to spoken language being used to teach content areas. The WFD estimates that only 20% out of 32 million deaf children around the world are receiving basic education (World Federation of the Deaf, 2016). Additionally, only 1–2 percent of deaf people across the globe access education through sign language (World Federation of the Deaf, 2016). This is particularly true among deaf women, girls, and people in low-

ABOUT THIS DOCUMENT

resource contexts, profoundly affecting children who already face tremendous barriers to economic and social advancement opportunities.

The vast majority of deaf children and youth worldwide are not exposed to an accessible language, such as sign languages, until they start formal schooling. This results in serious delayed cognitive and language development in early childhood. Even when in school, only 1–2 percent of deaf students receive education in their sign language, leaving a large percentage of deaf students without access to a sign language in school (World Federation of the Deaf, 2016). Because of this, their language fluency in a primary language (sign language) is delayed, and in turn, their cognitive capacities are reduced and their secondary language (written language) is also delayed significantly. This eventually leads to academic difficulties and delays in their primary school years (Mayer, 2007). While the number of sign languages that are recognized by the government as either national and regional languages has been increasing, the education sector in the government has struggled to apply that in their pedagogical components (curriculum, instruction and assessment). Governments are strongly encouraged to recognize sign languages as the languages used by deaf communities, allocate funds and invest in sign language curriculum, instruction and assessment, because studies show positive impacts of sign language acquisition on deaf students’ achievements and, in turn, quality of life.

International studies show that deaf children’s early exposure to sign language results in:

Increased frequency in visual attention and shifting eye gaze, which leads to early vocabulary development due to focused stimulation and association between objects and their signed names. For example, the mother and the deaf child make eye contact and then the mother shifts her eyes to a book and points to the book. The child would follow the mother’s eye gaze to the book and see the book. The mother then signs “book.” The child eventually makes the connection between the signed word and the object.

Bailes et al., 2009; Liberman et al., 2018;
Liberman et al. 2022

Increased vocabulary repertoire, which helps them transfer language to a second language.

Lillo-Martin et al., 2021;
Rinaldi et al., 2014

Increased rapid visual response, which contributes to reading and written language development and aids in comprehension skills needed for reading.

Napoli et al., 2015; Ormel et al., 2022

Falling in Love with the Problem

CHAPTER

1



Credit: Clara
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USAID, Morocco

Dearth of Sign Language Storybooks

While there are thousands of e-books in hundreds of languages available for children on the internet worldwide (e.g., Bloom, eKitabu, Global Digital Library, NABU, and Pratham Books), the number of e-books in sign languages is very small. Recently, there's been a growth of bilingual (sign language and print language) e-books through funds from various organizations (ACR GCD, USAID, UNICEF, NGOs), departments/ministries of education, and schools for the deaf, but more efforts in publishing accessible storybooks are vital, and books need to be high quality and effective. However, until now, standards to create effective, high quality sign language storybooks had not been documented.

Importance of Books in Sign Language

Signed storybooks are useful for a large target population. The primary users are deaf children and their parents. Hearing parents of deaf children use signed storybooks to begin immersing their children in sign language and Deaf culture. Both parents and their deaf children can encounter profound challenges to their communication and parent-child interpersonal relationship. Reading together creates a strong bond between parent and child as they interact with the book. Accessible storybooks with sign language videos have the potential to further promote this bond through active child-parent participation during the reading. For these children, the stories must be presented in a highly visual form, including sign language (Cano, Artega Coliazos, & Bustos, 2015).



Credit: USAID, Morocco, Agidar

Secondary users include, but are not limited to, deaf children's immediate and extended family members and friends who assist deaf children in learning the stories and sign language. Additionally, early childhood teachers can use signed storybooks to teach both deaf and hearing students. This is one of the best ways to help hearing people communicate and empathize with their deaf peers and others in society from an early age.

For deaf children who primarily rely on sign language narration, e-books in sign language facilitate an understanding of the story's context. By providing sign language and images along with a written language, deaf children are supported in learning to read. Deaf children start learning to be bilingual from their preliterate childhood by viewing a sign language, reading a written language, and bridging the languages.

Storysigning³ written e-books provide access to existing stories for deaf children. Storytelling⁴ in sign language provides a way for deaf children to find a sense of self. It helps them learn their language and culture, and is passed from generation to generation. With every generation, sign language storytellers continue to change what they talk about, how they use their bodies, how they use different handshapes, and more recently, how they use rhythm to tell a story. Deaf culture is continually changing and storytelling preserves this culture. Just as hearing children learn from stories told in their indigenous languages, deaf children learn from stories told in their sign languages. As such, deaf children need to have access to and view signed stories by deaf signers and deaf storytellers from local, regional, and national deaf communities in order to acquire language and culture as well as knowledge and skills.

³ Storysigning is a retelling translation of a written story in sign language.

⁴ Storytelling is a telling of an original story in sign language

Early childhood teachers can use signed storybooks to teach both deaf and hearing students. This is one of the best ways to help hearing people communicate and empathize with their deaf peers and others in society from an early age.

From accessible stories in sign language and deaf language models, deaf children receive the cross-cultural tools necessary to navigate, survive and thrive in school, work and life (Cawthorn et al., 2016; Gale et al., 2021).

Landscape Review

Learning from Prior Storybook Works

The prior works of accessible storybook libraries/platforms reveal important features for multilingual storybook development. This is not a comprehensive list of sign-text bilingual e-storybook libraries. Table 1 identifies accessible features of those digital libraries/platforms.

Table 1: Accessible Features for Digital Libraries

	SIGN LANGUAGE STORYBOOK VIDEOS	TEXT TO SPEECH AUDIO	OFFLINE ACCESS	MAGNIFICATION	CONTENT FILTERING DISTRACTION REDUCTION	EXPORT FORMAT TO OTHER PLATFORMS	OTHER FEATURES
Deaf World Around You (WAY)	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Let's Read	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			Multiple user profiles can be created
Bloom	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
eKitabu App	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			
Global Digital Library (GDL)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>	
African Storybook			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			
Bookshare	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			Audiovisual speed control



World Around You

Deafworldaroundyou.org

Developed by a deaf-led team at RIT/NTID, World Around You (WAY) is an online library and a content creation platform that allows for multilingual signed stories with written text to be created and distributed. The library contains books in more than 15 sign languages. Users can combine images, text, and video of signing storytellers into web-based visual storybooks with ease. They can also create interactive glossary words and simple vocabulary-reinforcing games using the uploaded assets from the published storybooks. Storybooks can be “liked,” shared, saved, and sorted by both signed and written languages of the story and more.



Bloom & Bloom Library

bloomlibrary.org/create
bloomlibrary.org/read

Bloom is an easy-to-use software for creating Sign Language books by adding images, text, and video. These video books can be distributed in other ways or accessed in the Bloom Library, which allows readers to read e-books or download their PDF versions. Bloom can be used to create books for print, read online, or download for offline use. Books can include text, images, narration (to make books accessible for those who are blind, low vision or otherwise print disabled), and video (to create sign language books for children who are deaf/hard of hearing). Books are created offline in the Bloom Editor (Windows or Linux) and can be read offline in the Bloom Reader Android app. The Bloom editor supports both the creation of new content and the adaptation of existing Bloom books.



Let's Read

letsreadasia.org

Let's Read is a digital library of storybooks in multiple languages. The library, drawn from The Asia Foundation's 18 offices in the region and deep ties in local communities, includes an unprecedented collection of relatable, local language books accessible to all children.



eKitabu

ekitabu.com/content/

eKitabu provides accessible digital content for inclusive and quality education in local African languages through their open architecture, global collection of digital content.



African Storybook

africanstorybook.org

African Storybook provides open access to picture storybooks in the languages of Africa. The African Storybook is particularly suitable for reading promotion in multilingual contexts as the same title is often available in multiple languages.

GDL

Global Digital Library

Digitallibrary.io

Global Digital Library is also a library of e-books where readers can read books, including sign language storybooks.



Canales

canales.org.ar

Developed by a civil association in Argentina, this platform's video books support reading for deaf children. The videobooks are produced by a team of deaf and hearing people. The platform aims to give deaf children access to their second language, Spanish, with support of their sign language, Argentine Sign Language.



Bookshare

bookshare.org

Bookshare is an online library of accessible e-books for people with print disabilities.



Peter's Pictures App **app.peterspicture.com**

Peter's Picture app is a web-based interactive adventure video series designed to help preschool-aged deaf children (ages 3–6) develop American Sign Language (ASL) and English literacy (Golos, 2013). Deaf children can view story videos and play learning games in the classroom with early childhood educators or at home with their parents.

UNF Digital Humanities Institute Project Portfolio

SMARTSign **unfdhi.org/portfolio/smartsign-2**

Weaver and Starner (2011) created a mobile application named SMARTSign, which helps parents learn sign language to communicate with their deaf children on a daily and immediate basis. The current version is SMARTSign 2.0. The application includes a video-based sign dictionary, sign techniques, grammar, and information about Deaf culture.



Pratham's StoryWeaver **storyweaver.org.in/prathambooks**

StoryWeaver is an open-source book authoring software. Pratham has a library with quality, affordable storybooks in multiple Indian languages to support reading acquisition among children.

VL2 STORYBOOK APPS

Visual Language and Visual Learning (VL2) Storybook App **vl2storybookapps.com**

Gallaudet University developed the VL2 storybook platform — an iPad app that focuses on visual language and learning. In their research, they found that visually rich interfaces are the most crucial way for children to learn a written language. The platform also provides interactive text on the screen, allowing users to click on the text to learn how to spell the word in ASL as well as in English. The app first focuses on story comprehension and then engages users in learning finger-spelling and text-spelling with clickable glossary/phrases.

Signed Storybooks Examples

On this page are images of signed storybooks from all around the world.

Video-based signed storybooks

Figures 1–6 show examples of a video-based signed storybook.



Figure 1. Open caption/subtitle in the video (eKitabu, 2020).



Figure 2. Open caption/subtitle with full image background in the video (Irish Deaf Society, 2020).



Figure 3. One-page image with embedded written language in the video. No open caption/subtitle (Deaf Development Programme, 2019).



Figure 4. Visual two-page book image behind the signer including print texts within the image (Canales, 2020).



Figure 5. Embedded images in the video. No open caption/subtitle. (AuslanStorybooks, 2014).



Figure 6. One-page image in the video. No open caption/subtitle. (EN-ABLE, 2021).

Storybook platforms with EPUB features

Figures 7–8 show examples of a storybook platform with sign language video and written language text components.



Figure 7a. Image page without any languages (World Around You, 2020).



Figure 7b. Independent language mode (World Around You, 2020).

In Figure 7a, the application displays only a page image at a time so children can visualize the story without any cognitive load. In Figure 7b, children can also see the signer, who translates the story in sign language. Additionally, they can still see the story’s corresponding picture inserted in the top-left corner or in the background. While the signer is narrating the story in the signed language, the written



Figure 8: An example of the embedded signed video and two language modes (VL2 Storybook App, 2018).

language appears on a separate window box below the signer and the corresponding picture. Hence, children will first see the picture and then they will look at each language one after the other. When the children feel ready to proceed to the next page, they advance by pressing the right arrow. The written text can be turned off.

In Figure 8, similar to Figure 7a-b, the image, the signed text and the written text are shown separately on the same screen. Figure 8 shows a bookmark and highlighted written texts.

How Deaf Children Learn to Read and Read to Learn

CHAPTER

2



Credit: USAID,
Mission of Hope,
Cabaret, Haiti

All children's brains process language as language regardless of whether the language is spoken or signed (Petitto, et al., 2016). In order for healthy language development to occur, all children between 0-8 years old, hearing or deaf, need early access to language that is fully accessible to them. This helps to develop a full-fledged cognitive capacity to tackle complex skills required for subsequent literacy and academic learning. With inherent inaccessibility of sound and lack of systematic support for the inclusion of signed language in their environments, many deaf children do not have consistent, natural, and adequate exposure to language throughout their early years, especially during the critical period for language acquisition (Kronenberger, Pisoni, Henning, & Colson, 2013; Lederberg, Schick, & Spencer, 2013).

Language Development in Deaf Children

With early and continuous access to language between 0-8 years old, deaf children develop healthy language and cognition required for subsequent growth in learning. The critical period of language development occurs when the brain is still developing and experiencing neuroplasticity (Van Staden, 2020; Bialystock & Kroll, 2018). Language deprivation is the persistent lack of access to a language which can lead to grave adverse consequences in linguistic, social, psychological, and cognitive developmental domains in deaf children's life (Murray, Hall, & Snoddon, 2019). Neurological and cognitive development can be altered to the extent that a deaf child "may be unable to develop language skills sufficient to support fluent communication or serve as a basis for further learning" (Lederberg, Schick, & Spencer, 2013, p. 22). As a result, many deaf children do not have a consistent, natural, and adequate exposure to language during their early years (Kronenberger, Pisoni, Henning, & Colson, 2013; Lederberg, Schick, & Spencer, 2013). This explains noted gaps in reading achievement in deaf children throughout their schooling years (Humphries et al., 2016; Traxler, 2000).

Recent evidence indicates the benefits of providing deaf children access to signed language along with spoken language (for those whom it might benefit). This access helps prevent and/or mitigate the detrimental effects of language deprivation and facilitates language and cognitive skills that are required for successful literacy development (Hrastinski & Wilbur, 2016; Lange, Lane-Outlaw, Lange, & Sherwood, 2013).

Typical Language Development

Similar to hearing babies learning to speak naturally without much effort, deaf babies can have the same experience in their language development through exposure to signed language (Secora & Smith, 2021; Anderson & Reilly, 2002; Petitto & Marentette, 1991). The only outstanding difference in the development of language between deaf and hearing babies is that signing babies can produce their first words four months earlier than non-signing babies, as hand coordination develops earlier than vocal skills. Hearing parents in some countries are using baby signs with their hearing babies to

The only outstanding difference in the development of language between deaf and hearing babies is that signing babies can produce their first words four months earlier than non-signing babies, as hand coordination develops earlier than vocal skills.

“

The first step in turning deaf children into readers appears to be to make sure they have a language...”

read these linguistic advantages (Pizer, Walters, & Meier, 2007). When deaf children meet age-appropriate language milestones between 0-5 years old, they develop typical cognition, executive functions, and reasoning skills that are required for learning to read and write (e.g. Mayberry, 2010; Kronenberg et al., 2016). As Goldin-Meadow and Mayberry (2001) concluded in their meta-analysis on how deaf children learn to read, “The first step in turning deaf children into readers appears to be to make sure they have a language...” (p. 226). Deaf children that learn sign language naturally will be able to develop literacy skills that enable them to learn a written language.

Interactive and Mediated Sign Language Stories

While it is true that deaf children can learn when viewing alone, they learn more with adult mediation (Moses et al., 2015). If the sign language storyteller themselves—before, during, and/or after the story—asks deaf viewers to copy them or asks them questions, the deaf viewers are more likely to engage with the story and the storyteller. The storyteller in the video can ask open ended questions and allow at least three seconds for response, ask viewers to copy, or ask viewers to point at a specific object in the picture (Moses et al.).

Language Facilitator — Deaf Child (Story Reading)

Parents, language facilitators, and adults working with deaf children need to become familiar with, and see modeled, strategies for reading books to deaf children using written languages and signed languages. It can start with watching a deaf mentor using the strategy (modeling) with the child. The caregiver then can try that strategy with their child. With the support of sign language, reading books together reinforces deaf children’s signed and written language development.

A facilitator (e.g., parent, sibling, caregiver, or teacher) can help deaf children learn how to read by doing a picture walk which involves looking at the pictures in a book and talking about the details in the pictures.

The goal is to help the child become familiar with and interested in the story before introducing the text. For more information, see Picture Walk in Section 2: *How Deaf Children Learn to Read and Read to Learn*.

Research-based recommendations for viewing with children via the Peter's Pictures website (Moses et al., 2015, Golos & Moses, 2015, [jstor.org/stable/26190975](https://www.jstor.org/stable/26190975), app.peterspicture.com)



The language facilitator has deaf children view each sign language video multiple times.



The language facilitator encourages children to interact with the print on the screen.



The language facilitator focuses on different skills in different videos for viewing.



The language facilitator encourages children to sign along with the main character (For example, in a Peter's Picture video, the main character tells children: "Let's Sign this Together!").

- The language facilitator chooses one video and focuses on the targeted skills in that video.
- The language facilitator chooses one video for children to watch without teacher/family encouraging interaction.
- The language facilitator has children watch the video again and encourages active engagement. They can respond to the video and/or talk while watching.
- In subsequent viewings, the language facilitator pauses the video, questions children about the video content, and discusses with them.



The language facilitator then provides follow up activities to reinforce the concepts in the video.



After having children view more than one episode, the language facilitator can focus on targeted skills both within and across videos.

Research-based strategies developed by the [Laurent Clerc National Deaf Education Center](#):

Fifteen principles for reading to deaf children



Translate stories using their sign language.



Keep both languages—the sign language and the written language—visible.



Embellish the text.



Reread stories, moving from telling the story to reading it.



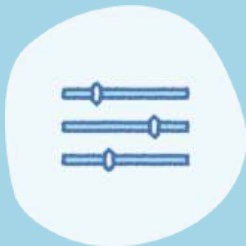
Follow the child's lead, respond to what interests the child.



Make what is implicit explicit.



Adjust sign placement to fit the story.



Adjust signing style to fit the story.



Connect concepts in the story to the real world.



Use attention maintenance strategies.



Use eye gaze (visual attention) to elicit participation.



Engage in role play to extend concepts.



Use sign variations for repetitive written phrases.



Provide a positive and reinforcing environment.



Expect the child to become literate.

Video examples of reading books to deaf children using the aforementioned principles include:



This [video](#) shows older deaf students reading books to young deaf students.

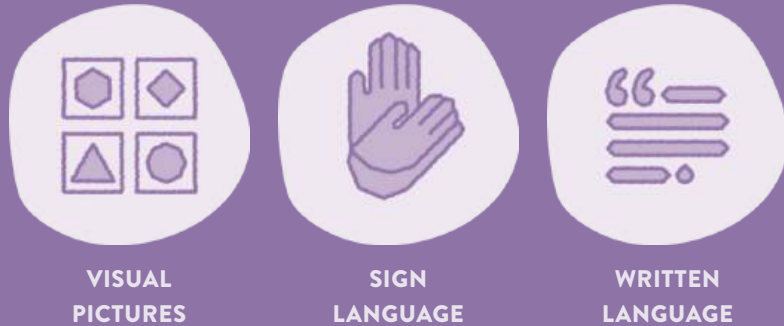


This [video](#) shows how the language facilitator uses principles for reading to a deaf child.

Attention Span/Split of Children who are Deaf

Storybook creators must investigate how story content should be presented to deaf children. Simultaneous delivery of images and languages (signed video and written languages) may increase the cognitive load for children and hamper their ability to maintain attention to the information.

To minimize this cognitive load, storybooks should present visual pictures, sign language, and written language separately or sequentially (i.e., showing the sign language text, then the written language text).



Vettori and Mich (2011) designed a story-based literacy tool, also known as a LOgic-based e-tool for DEaf children or LODE, and tested it with the deaf children. They found that stories that are simple to comprehend and use an ample number of static visuals and animations were more likely to attract deaf children and retain their attention for a longer period of time.

Osaimi et al. (2009) tested an e-learning prototype with deaf children to define the user interface guidelines. Importantly, they found that deaf children need a highly colorful interface to maintain engagement. However, the interface ultimately needs to be simple and structured. Colors can be used to add vibrance but only if they do not distract from the delivery of the information.

Moses et al. (2015) conducted a pilot study on the Peter’s Picture app, examining how deaf children can attend to and interact with education media in sign language. The app contained sign language episodes that were 40 minutes long. The study showed that deaf preschool children would attend to such an episode for longer periods of time only when it was interactive.

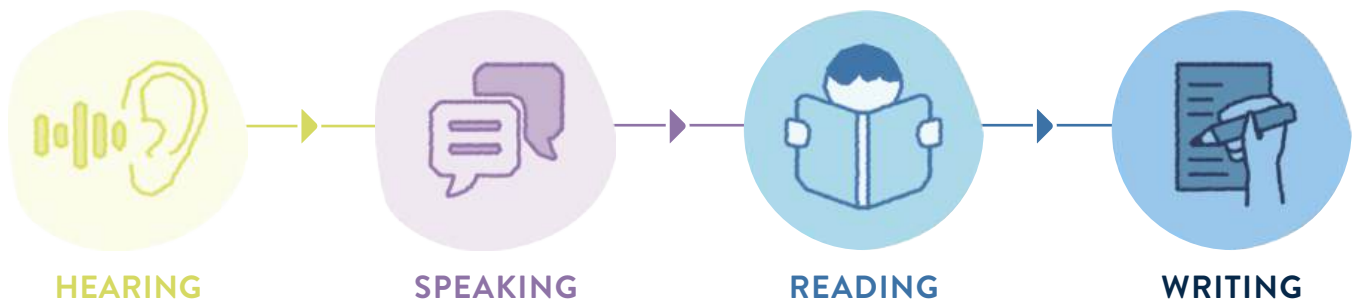
Literature on visual learning and attention, language learning and development, and technology for literacy development shows that deaf children:

- Acquire a sign language naturally when exposed to deaf fluent signers
- Acquire a sign language with similar developmental milestones as hearing children who acquire a spoken language

- Require visual prompts to delivered content (e.g., waving, eye contact)
- Experience a cognitive overload when information is delivered simultaneously in multiple modes (i.e. written text, signed video, and a visual image)
- Learn best with interactive technological tools, such as having the ability to advance or turn back a page of the story, click on a written word for its definition, or highlight a written phrase to see its signed delivery
- Learn best when content is delivered in this sequence: image, sign language then written language
- Need access to a glossary for review and reference

Connections Between L1 Modality 1 (Spoken Language) and L1 Modality 2 (Written Language)

Hearing children learn their primary language through hearing, speaking, reading, and writing (in that order):



Hearing: Children first acquire language through hearing spoken words in their surroundings. Speakers can include parents, grandparents, siblings, and other relatives, as well as any adults and peers in their proximity. Language can also be acquired by listening to electronic technological devices (e.g., radio and computer).

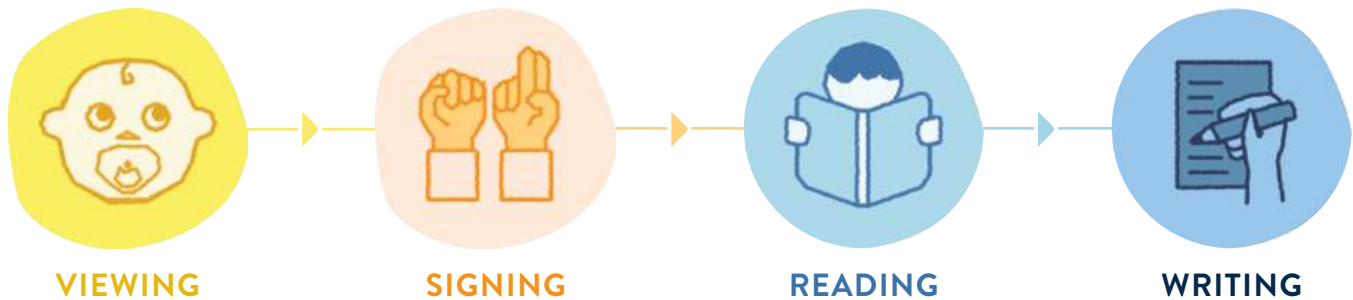
Speaking: Children hone and expand language by speaking, experimenting, and playing with spoken words. Children imitate and generate the words they learned by hearing.

Reading: Children develop an understanding of their language's print system through reading. Reading aloud is one of many methods through which children associate spoken language with reading.

Writing: After learning their language's print system, children copy, write, experiment, and play with words in print (Pullen & Justice, 2003).

Connections Between L1 Modality 1 (Signed Language) and L2 Modality 2 (Written Language)

Deaf children rely on visual information for bilingual learning. Therefore, it is of utmost importance that they learn sign language in order to converse and bridge to a written language through viewing, signing, reading, and writing:



Viewing: Deaf children first acquire fundamental language skills and skills in a particular sign language through viewing natural sign language as it is used in their surroundings and through social interactions with signers. Signers can include parents, grandparents, siblings, and other relatives, as well as any adults and peers in their proximity. Language skills can also be acquired by viewing electronic technological devices (e.g., television and computer).

Signing: Children hone and expand their sign language by signing, experimenting, and playing with signed words. Children imitate and generate the words they learned by viewing.

Reading: Children develop an understanding of their language's print system through reading. With the support of sign language, they bridge the languages by associating signed words/concepts to written words/concepts. In some countries that use manual fingerspelling to represent individual written alphabet letters or script marks, children connect with sign-fingerspelling-print. Signing along with reading is one of many methods through which children associate signing with reading. Adult caregivers often use sandwiching and chaining to promote association between the written words and the signed word with aid of fingerspelling.

- Sandwiching follows this format: SIGN, FINGERSPELLING, SIGN or FINGERSPELLING, SIGN, FINGERSPELLING
- Chaining uses multiple modalities of a term, for example, sign, fingerspelling, and showing image

Writing: After learning their language's print system, children copy, write, experiment, and play with words in print.

A storybook's primary goal is to enable deaf children to view the story in their sign language and associate the signed concepts with the corresponding written concepts.

With signed language fluency in place, deaf children begin their journey towards becoming readers and writers. There are significant findings that indicate strong relationships between signed language proficiency and overall literacy skills (Dostal & Wolbers, 2014; Hrastinski & Wilbur, 2016; Mayberry, del Gudice, & Lieberman, 2011; Scott, 2015; Strong & Prinz, 1997). For example, a study looked at the effects of signed language proficiency on different areas of academic attainment of 85 deaf students from grades 6 through 11 in an ASL/English bilingual program in the United States (Hrastinski & Wilbur, 2016). Sign language proficiency was the only variable that significantly predicted reading, language, and mathematical scores. When other variables such as having cochlear implants, home language, and age of enrollment were looked at, SL proficiency still accounted for 35.7% of the variance in reading scores. As the authors noted, “What this indicates is that many of the variables that are often pointed to as relevant to reading and other academic outcomes for deaf students are not as important, even combined together, than ASL proficiency on its own. This finding suggests that some traditional practices may need to be reconsidered” (p. 164).

Considering the importance of sound-based phonological awareness for hearing children (National Early Literacy Panel, 2008), researchers and educators have long debated whether this is also critical to the development of deaf readers (Easterbrooks, Lederberg, Miller, Bergeron, & Connor, 2008; Mayberry et al., 2011; Wang, Trezek, Luckner, & Paul, 2008). Based on 20 years of cognitive research, Petitto and colleagues have proposed a new way of thinking about the connections between language and

Sign language proficiency was the only variable that significantly predicted reading, language, and mathematical scores.

literacy: “the crucial link for early reading success is not between print and sound, but between print and the abstract level of language organization that we call phonology—signed or spoken...” (2016, p. 367). Other researchers studying phonological awareness in deaf children have made a similar claim, “Having a strong phonological foundation in any language may be more important than the modality through which it is realized” (McQuarrie & Abbott, 2013, p. 96). Research on successful deaf readers challenges the belief that phoneme-to-letter mapping (or phonics) is the only way to learn to read and write (Petitto et al., 2016). Many successful deaf readers learn to read without relying on sound-based approaches (Mayberry, del Gudice, & Lieberman, 2011).



Credit: Deaf Child Worldwide

One area that is often overlooked is emergent literacy development, which impacts all future learning. Reading readiness varies among deaf children before they start school. Some deaf children do not have any print experience prior to school enrollment. But the notion that deaf children must have a strong foundation of sign language before being exposed to print is inaccurate. They first need to develop pre emergent reading skills (e.g., pretending to read books; looking at signed videos; labeling objects in books; pointing to images on the screen; understanding that books are handled in particular ways, and more). Deaf children can also learn about print prior to learning to read (e.g., appearance of print; direction of reading [left to right, right to left, top to bottom]; concepts of print; that print carries meaning; print in the environment). A facilitator (e.g., parent, sibling, caregiver, or teacher) can help deaf children learn how to read by doing a picture walk which involves looking at the pictures in a book and talking about the details in the pictures. The goal is to help the child become familiar with and interested in the story before introducing the text. Wordless books, one-word books, two-word books, and similar books reinforce emergent reading development. Children worldwide should be able to learn about print before they start school.

Hearing children are different in that they already have acquired a spoken language, built background knowledge, and developed some pre emergent reading skills (listening to stories) before they start school. Deaf children need accessible stories in their languages to develop both pre emergent and emergent literacy skills for viewing and reading.

Enns et al., 2007; Golos et al., 2018)

Reading Comprehension

Findings learned from the latest international studies on deaf children and reading are 1) sign language and written language proficiency are positively correlated and 2) early exposure to sign language and academic achievement are positively correlated.

Clark et al., 2016; Hoffmeister, 2000; Padden & Ramsey, 2000; Morgan, 2005; Tang et al., 2014, Van Staden, 2013

With support of sign language narrative and comprehension skills, early acquisition and mastery of a sign language facilitates the acquisition of a written language.

Niederberger, 2008; Rathmann et al., 2007

One of the best innovations for improving reading comprehension among deaf children is to strengthen their ability to comprehend and produce a natural sign language.

To fully participate in society, all children need to learn to read the language of their country or region. Reading comprehension largely depends on vocabulary knowledge and background knowledge. However, deaf children face greater challenges in learning to read a language, as they often do not have enough background knowledge to start reading. Children build their background knowledge of daily life (e.g., family members, house objects, natural objects, food) through the use of language at home. But many deaf children have limited background knowledge since the vast majority of hearing parents do not use sign language to communicate with their deaf children. These children often begin learning to read when they start school, where sign language is the language of instruction. Learning signed words through their sign language helps build vocabulary repertoire. Signed words are associated with the objects and/or actions as depicted in the image which, in turn, helps build background knowledge. Viewers/readers then bridge one language to another by associating the same concepts in the languages. The vast majority of deaf children who primarily use sign language tend to bridge signed words to their corresponding written words by reading, fingerspelling, and/or writing.

In the past few decades, there has been an increase in research dissemination in the area of bilingual education. Notably, key systematic findings show 1) sign language and print language proficiency are positively correlated and 2) early exposure to sign language and academic achievement are positively correlated. A deaf person's ability to sign is strongly associated with the person's ability to read and write. In order to improve reading comprehension, one of the best strategies is strengthening deaf children's ability to comprehend and produce a natural sign language. Exposing deaf children to deaf fluent sign language models with adult mediation helps increase their sign language comprehension skills. Similarly, deaf children's reading comprehension increases with proper signing adult mediation.

Golos et al., 2018; Hoffmeister, 2000

Based on the body of research about how deaf children learn through multimedia involving signed languages and written languages, RIT/NTID developed these minimum, silver, and gold standards for signed storybook development.

Storybook Glossary-Dictionary⁵

Deaf children learn to read by associating a visual concept and a signed word to a written word. This association is often called dual coding. Dual coding is a combination of words and visuals such as pictures, signed words, written words, and so on. A glossary is one way to support that dual coding. Sign language glossary includes signed words and their meaning-equivalent written words, if any. Not every written word has a meaning-equivalent signed word (one-to-one lexical equivalents). A written word might require a combination of at least two signed words. Similarly, a signed word might require a combination of at least two written words. A written word may have several different translations in a sign language, and a given signed word may have several different meanings that are translated into different written words.

A signed word is made with the hand(s), sometimes in combination with a nonmanual component: handshape, location, and movement (Schermer, 2016). The word must have a clearly described meaning, which is conventional among deaf people who use their national, regional, or local sign language.

A sign language dictionary differs from a glossary in that a dictionary provides not only a word in sign and print but also includes more elaborate information. This additional information includes at least one definition of the word, at least one example of the word in a signed sentence, and its written sentence equivalent. It can also provide information about the word class and other grammatical information. If needed, details on the form of the signed word, especially when it is presented in the form of a drawing or a picture; information on regional variation; and/or information about form and meaning relations with other signed words can also be provided (Schermer, 2016).

For storybook videos that stand alone (no embedded interactive features), the authors recommend that all videos include a sign language glossary at the end of the video. Individual words are signed and written. Words should also be fingerspelled only if their sign languages have fingerspelling. Such a glossary allows viewers (deaf children, parents, language facilitators) to check for a particular signed word.

An embedded interactive glossary allows readers to click glossary words in the written language display. Clicking glossary words will pop up a video loop of a person signing the word, in addition to an image illustrating the word, a definition of the word, and some sentence examples containing the

⁵ While sign language dictionary development is not in the scope of this project, a list of sign language dictionaries worldwide can be found in Appendix A.























Credit: Deaf Child Worldwide

word. Definitions/sentences/explanations should be provided both in the written language and in the sign language. Thus, a glossary for a story should reflect the full range of meanings that are used within a story. If a written word has more than one signed equivalent, more than one meaning should be given to provide a more robust understanding of the written word (at least in its usage in that story). Likewise, if a signed word has more than one written equivalent, more than one meaning should be given. The authors recommend that the written word be adjusted according to reading level, and is most appropriate for older children who are expanding their vocabulary.

STANDARDS SUMMARY: Standards for Sign Language Storybooks

		MINIMUM STANDARD	SILVER STANDARD	GOLD STANDARD
Storybook Features	Image on each page			
	Sign language video text			
	Written language text			
	Sign language video and embedded written language shown simultaneously (open captioned or subtitled) ⁶ • Captions/subtitles follow the signer or • Signer follows captions/subtitle			
	Sign language video viewable on each page			
	Written language text shown in static form, separate from the signed video text			
Deaf Signer	Sign language narrator is Deaf			
	Deaf sign language narrator uses natural sign language used within the country's Deaf Community			
	Deaf sign language narrator uses natural sign language as identified by ISO 639-3 code			
Glossary/Dictionary	For storybook videos that stand alone (no embedded interactive features), all videos include a sign language glossary at the end of the video. Individual words are signed and written and words are fingerspelled (if the sign language has fingerspelling).			
	An embedded interactive glossary provides a video loop of a person signing the word, an image illustrating the word, a definition of the word, and sentence examples containing the word.			
	Definitions/sentences/explanations are provided both in the written language and sign language.			

	If a signed word has more than one written equivalent, more than one meaning is given (adjusted according to reading level, and most appropriate for older children).			
	Glossary/dictionary included			
	Glossary is at end of video			
	Glossary within the story			
	Glossary: shows word in sign			
	Glossary: shows word in print			
	Glossary: shows word in fingerspelling (if available) ⁷			
	Glossary/dictionary: definition/sentence is in sign			
	Glossary/dictionary: definition/sentence is in print			
Interactive Tools Within Each Page of the Story	Clickable glossary/dictionary			
	Accessible customization features for low-vision readers			

More detailed minimum and gold standards can be found later in this document.

⁶ In coding, video time stamping of subtitles/captions can be set: the signer can follow the captions/subtitles; the captions/subtitles can follow the signer; or they are not in sync. Either of the first two options meets the minimum standard requirements.

⁷ Some sign languages do not have fingerspelling that represents written alphabet letters or script marks.

Creating or Adapting Content: Sign Languages and Written Languages

CHAPTER

3



Credit: Erin Williams/ACR GCD

When creating or adapting content in a storybook, considering the target audience’s reading (written language) and viewing (sign language) levels is important. This allows content creators to tag the storybook with the proper reading and viewing levels in terms of grade appropriate content and language. This section highlights features that help determine proper grade level reading and viewing.

Reading Levels and Grade Appropriate Content — Preschool, Kindergarten, First Grade, Second Grade

Guidelines for Reading Grade Leveling

Learning to read is a gradual process. Readers must first build skills for processing text —starting with early reading behaviors—and then become fluent in reading increasingly complex texts. Since written languages worldwide differ vastly, creating a standard for reading grade leveling is difficult. Word length varies among written languages as well as the number of words to express the same concept.

The guideline reading levels/grades should be seen as a continuum of progress for readers. Levels/grades should be linked to the reader’s reading development, not the reader’s age, as readers worldwide have different language fluencies. In the deaf educational context, Deaf children need to experience the progression that all readers experience when they start to read books. As mentioned earlier, Deaf children are most likely to start school with no language. It is not because they are deaf, it is because they are deprived from access to language when they are young at home and at school. Deaf students do not have access to languages when they have teachers who are not fluent in sign language or familiar with pedagogies that work with deaf children. Deaf children in most countries may start learning to read at an older age, such as a Deaf teenager reading at level 1. Providing stories that stimulate their language development to Deaf children when they are young, especially when they are 0-8 years old is critical.

“

Finding the correct reading level for a child is like finding her the right size of shoes – it needs to be ‘just right.’

– PRATHAM’S STORYWEAVER

Wordless books tell a story without any printed text. Readers use illustrations in wordless books to understand the story as the images communicate action and emotion, among other things. Readers also use illustrations to imagine the story or their own story. Children of all ages enjoy reading wordless books independently. While wordless books have no printed text, they can be told in sign language. The

signing narrator uses illustrations to tell a story or discuss details in the illustrations. Wordless books help deaf children develop their emerging reading skills (e.g., sign language vocabulary building, sign-image association, book handling and usage, imagination and creativity).

One-word books tell a story with one printed word provided with each illustration or image. Printed words reinforce vocabulary development as each printed word describes the illustrative concept. Readers associate the print word to the concept in the illustration (e.g., the printed word “lion” with the illustration of a lion gazing across the grassland). The narrator can sign only the printed word in their sign language. The narrator can also sign the word and then tell what is happening in the illustration. For example, with the lion illustration, the narrator signs the written word “lion” and then tells that the lion is gazing across the grassland.

There are two-word books, three-word books, and so on. For example, a story about a deaf girl who goes fishing on her own by taking her grandfather’s boat and fishing poles and then surprises her family with a bucket of fish for dinner can be told in a wordless book, one-word book, two-word book, etc.

Deaf children who start school with no language foundations might want to start with wordless books and progress to one-word books to develop their emerging reading skills. They can then advance to one-sentence-per-page books and progress to multiple-sentence-per-page books.

Below are best practices for reading materials for children who start school with some language foundations.

USAID suggests the following guidelines should be applied (2014):

Number of words per line and number of lines per page:

- For students in grade R (\pm 5 years old), there should be approximately two to four words per line and four to five lines of text per page.
- For students in first grade (\pm 6 years old), there should be approximately four to six words per line and four to six lines of text per page.
- For students in second grade (\pm 7 years old), there should be approximately six to eight words per line and six to eight lines of text per page.
- For students in third grade (\pm 8 years old), there should be approximately eight to 10 words per line and eight to 10 lines of text per page.
- This progression in word density is to ensure that learners gain enough exposure to reading practice to develop their reading acuity, speed, visual span and vocabulary development. Word

density patterns should continue getting tighter as the content progresses in grade level.

- Leveled texts facilitate early grade readers’ access to reading material that is at their reading level. Leveling texts can be from very easy to challenging through more and longer sentences, longer paragraphs and then chapters.
- Supplementary reading materials for students in grades R–3 should also feature double spacing between lines with three letter spaces between words.
- Spacing between letters should not be expanded by more than 10 percent.

Table 2: Summary of Recommendations: Letter, Word Spacing, and Alignment (USAID, 2014)

VISUAL ASPECT	GRADE R (± 5 YEARS)	GRADE 1 (± 6 YEARS)	GRADE 2 (± 7 YEARS OLD)	GRADE 3 (± 8 YEARS OLD)
NOTE ON NUMBER OF WORDS PER LINE	The number of words per line suggested below is based on studies in countries where the words are of an average length. These recommendations would not be suitable, for example in South Africa, where some of the languages contain words with up to 16 letters. These languages may also need more words to describe concepts that would only take one or two words in English. Therefore, any development of supplementary reading materials should take into account the unique context of the region and the language(s) for which they are being developed.			
WORDS PER LINE	~ 3–4 words	~ 4–6 words	~ 6–8 words	~ 8–10 words
SUGGESTED SPACING	Three letter spaces between words and slightly expanded spacing between the letters of each word. Standard spacing: the spacing used in normal Courier text: 1.16 times the width of the lowercase x. Do not expand the spacing between letters by more than 10 percent — i.e., more than 1.28 times the width of the lowercase x used in the normal Courier text.			
LINES PER PAGE	~ 4–5 lines	~ 4–6 lines Increase density from beginning of the book to end of the book	~ 6–8 lines Density does not increase as substantially as in first grade	~ 8–10 lines Again, the density should remain more or less the same throughout the course of the year
SUGGESTED SPACING	Text should be left-aligned (for Latin scripts) or right-aligned (for right-to-left scripts) with clear, hierarchical spacing between elements such as headings, paragraphs, and lines within a paragraph. If double spacing is standard between individual lines, then there should be four line spaces between paragraphs and six line spaces between headings/titles and the first paragraph/line of text. If there is only one paragraph on the page and a heading, then there should be about four lines of space between the heading and text.			
BOLD & ITALIC TEXT	The use of bold and italic text (excluding titles) is not recommended for early grade reading material because they are additional typographic cues that must be processed by the student. Bold text also adds to the tonality of the page, so it should be used sparingly.			

In addition to the USAID recommendations above, the authors recommend addressing font choice:

FONT CHOICE	<p>There are comparable font variations in Latin scripts and non-Latin scripts, such as the different calligraphic variants of Arabic script (here).</p> <p>There are no clear results on the relative advantages of a serif (e.g., Times), a sans-serif (e.g., Arial, Helvetica) font, a fixed-width (e.g., Courier), and/or a proportional font.</p>		
	<p>SERIF</p> <p>Times</p> <p>Regular <i>Italic</i> Bold <i>Bold Italic</i></p>	<p>SANS-SERIF</p> <p>Arial Helvetica</p> <p>Regular Regular <i>Italic</i> <i>Italic</i> Bold Bold <i>Bold Italic</i> <i>Bold Italic</i></p>	<p>FIXED-WIDTH</p> <p>Courier</p> <p>Regular <i>Italic</i> Bold <i>Bold Italic</i></p>
<p>The script/font selected should be one that is in common use in the community where the children live.</p>			

Pratham’s StoryWeaver has their reading levels as shown in Table 3.

Table 3: Modified Summary of Pratham’s StoryWeaver English Levels (Storyweaver, 2020)

	LEVEL 1: BEGINNING TO READ	LEVEL 2: LEARNING TO READ	LEVEL 3: READING INDEPENDENTLY	LEVEL 4: READING PROFICIENCY
AGE	2–5 y. old	4–8 y. old	8–15 y. old	12+ y. old
WORDS	Easy words, word repetition	Simple words/ concepts	Complex vocabulary	Rich vocabulary
SENTENCES	Short (less than 5 words per sentence on a page)	Short to long sentences Simple paragraphs	Longer sentences Short paragraphs	Compound sentences
STORY STRUCTURE AND CHARACTERISTICS	Stories that use rhyme and rhythm, repetition of words and short phrases	Stories with linear, engaging plots, repetition of phrases	Stories on popular topics (adventure, mystery), well developed characters	Stories using language play (metaphors, similes, idioms), complex plots, longer, more nuanced stories
TOTAL NUMBER OF WORDS	0–250	250–600	600–1500	1500+

Viewing Levels and Grade Appropriate Content — Preschool, Kindergarten, First Grade, and Second Grade

Guidelines for Viewing Grade Leveling

Unlike the vast majority of written languages that are literal and usually measured by the number of words, sign languages are both layered and literal. For example, verbs and adverbs can be combined as a signed word (e.g., “walk slowly”). Similarly, nouns and verbs can be combined as a signed word (e.g. “She looks (in the direction of me)”). Like written languages, sign languages have a gradual range of complexity and density in words and semantics. Similarly, there is a gradual range of sentence structures, from simple to complex. Viewing signed texts aid in sign language development and comprehension. Such development includes the progression of linguistic features (i.e., sign phonology, lexical words, morphology, and semantics) and language structures (i.e., sentence structures, pragmatics, prosody, and discourse).

Like reading, viewing is a gradual process. Viewers must build skills for processing signed texts, starting with early viewing behaviors and becoming fluent in viewing increasingly complex texts. Since sign languages worldwide differ vastly, creating a standard for viewing grade leveling that fits all sign languages is difficult. The number of signed words to express the same concept varies among sign languages. The past two decades have seen a worldwide increase in sign language documentations, yet research in deaf children’s viewability of signed stories is almost nonexistent. RIT/NTID consulted with several sign language education experts in deaf early childhood education through primary grades to develop a working viewing grade

Like reading, viewing is a gradual process. Viewers must build skills for processing signed texts, starting with early viewing behaviors and becoming fluent in viewing increasingly complex texts.

leveling guideline, which is described in Table 4. There are teams of teachers, curriculum specialists, and researchers working to determine what is appropriate for each grade and some have developed pilot videos for preschool through first grade. Until there are several years of data from large groups of deaf children to provide a deeper understanding of different types of sign languages worldwide, the viewing leveling guidelines cannot be established. In the meantime, the viewing grade levels should be seen as a continuum of progress for viewers.

Deaf students' engagement with signed texts requires that they analyze the content, organization, effectiveness, and significance of the signed texts. The goal of sign language vocabulary progression is to introduce approximately five new signed words/concepts (not written words) per story. Table 4 includes viewing level recommendations and may also be used as a general leveling guide. The table does not include age ranges, as each grade might have children of different ages. Grades should be linked to the reader's viewing development, not the viewer's age or written language grade level, as viewers worldwide have different language fluencies. Story genres should vary for deaf children across the grade bands.



Credit: School-to-School International

Table 4: Working Viewing Grade Leveling Guideline

	LEVEL P	LEVEL 1A	LEVEL 1B	LEVEL 2
Content	<ul style="list-style-type: none"> Highly visual content to reinforce signed vocabulary Familiar, easy content (e.g., home, animals, family, nature, colors, counting, daily activities at home and in the community, play things) 	<ul style="list-style-type: none"> Easy content (e.g., home, animals, school, counting, colors, time, shapes, sizes, daily activities outside and in school) 	<ul style="list-style-type: none"> Familiar, easy content (e.g., family and home, play, pets, animals, school, time, food, community, friends, daily activities, the human body, weather, seasons, transportation, play things) Introduce content (friendship, relationships, behavior, responsibilities, feelings) Short adventures, simple plots, chronological events 	<ul style="list-style-type: none"> Familiar content close to viewers' experience (e.g., imagination, courage, fears, friendship, family relationships, self, home, nature, growing, behavior, responsibilities, feelings) Beyond viewer's immediate experience (e.g., different environments and communities, animals of the world)
Signed words (not written words)	<ul style="list-style-type: none"> Easy, common signed words Word repetition Character and setting naming as part of referencing expression for the story Noun + adjective 	<ul style="list-style-type: none"> Simple signed words used with high frequency 	<ul style="list-style-type: none"> Signed words used with high frequency Understand the meaning of some new words based on the context of other words and the image details in the story 	<ul style="list-style-type: none"> Content-specific words introduced, explained and illustrated in a video Wide variation of signed words for dialogue
Signed sentences (not written sentences)	<ul style="list-style-type: none"> Simple sentences Repeated similar sentence structure Noun + verb Noun + adjective + verb 	<ul style="list-style-type: none"> Simple sentences (both sentences and questions) Use of simple dialogue 	<ul style="list-style-type: none"> Simple and longer sentences (both sentences and questions) Simple and longer dialogues 	<ul style="list-style-type: none"> Longer sentences and longer dialogues
Story structure and characteristics	<ul style="list-style-type: none"> Sign language rhyme and rhythm (handshape and/or movement) Thematic vocabulary 1 character's point of view in the story 	<ul style="list-style-type: none"> Stories with sequential, engaging plots 1–2 characters' points of view in the story Problem solving Repeated actions Themes 	<ul style="list-style-type: none"> Stories with engaging plots and problem solving 1–3 characters' points of view in the story 	<ul style="list-style-type: none"> Popular topics Multiple characters Beginning, series of episodes, and an ending Description, temporal sequence, chronological sequence, question and answer
Total video time length⁸	Up to 1 minute	Up to 2 minutes	Up to 3 minutes	Up to 5 minutes

8 There may be technical limits in some of the software used, such as limits on how long a video can be in a given software platform. Users should check on this issue before planning their books. In addition, such limits may not be in the software itself, but in memory limitations of video equipment. Users should test to ensure they have the technical capacity to make long videos, many videos or many pages, before filming.

Guidelines for Sign Language Storytelling

Storytelling: Original Sign Language Stories

Like hearing people, deaf people love to tell original stories created in their sign languages—that have not been translated from written works. Their stories are valuable in passing their languages and deaf cultures to younger generations. Deaf children who use sign language can increase their vocabulary and grammar by repeatedly watching stories presented in sign language (in person or in a video). Pairing repeated viewings with targeted, explicit instruction (between the language facilitator and the deaf child) may increase the rate of language learning. Signed videos allow preservation of Deaf culture and sign language by:

- Teaching lessons/morals
- Teaching the language
- Teaching rhythm
- Using the sign space around the signer
- Using facial expressions
- Setting up the scene of the story
- Explaining, and role-playing as, the characters
- Shifting roles, if applicable
- Shifting the signer’s body to show different characters, if applicable

Sign language vocabulary can be taught explicitly, similar to the following:



Two young girls show ASL words of different animals with illustrations and props.

Sign Language Rhyme

Rhyme and rhythm are the kind of language play inherent in our natural interactions. Rhyme and rhythm in language are important parts of storytelling, especially for children. Rhyme is based on the repetition of portions of words. For spoken languages, the portions of words that get repeated are determined by sound. For

signed languages, the portions of words that get repeated are determined by movement, handshape, location, palm orientation, and/or other components of signs. Rhyming in spoken languages focuses on words that sound the same. Rhyming in signed languages focuses on words that look the same. One can repeat similar signs to create a visual rhythm by movement, handshape, location, palm orientation, and/or other components of signs.

The following links illustrate sign rhyme or visual rhythm:



Two deaf owners of HandTalk, Leala Holcomb and Jonathan McMillian, demonstrate examples of sign language rhythm for teaching deaf students in early childhood and preschool classrooms.



Leala Holcomb, a Deaf early childhood education teacher, shows the beauty of rhymes, rhythms and poetry with classroom activity examples. (Timestamp: 2:36–4:00)



Rosa Lee Timm, a Deaf performer, tells a story about a cow with ASL rhymes.



A video showing a school bus story using ASL rhymes.



A signer demonstrating an ASL movement dance.



A video showing a kindergarten class doing ASL percussion using handshape rhythms.

Sign Language Literature

Sign language literature is composed of poetry or stories told in sign language with an artistic approach usually reserved for theatrical performances. Dramatic performances and songs may be considered part of sign language literature. Characteristics such as visual play, handshape stories, and percussion signing are often used. Parameters such as handshapes, movement, placement, palm orientation, and nonmanual signals may be included.

Sign language poetry is signed in sign language word order, not written word order. Visual movement is central in the structure of the poem. Signs are used in an artistic and aesthetic way. Sign language poetry features are: rhyme, meter and rhythm. Handshapes, movement, paths, space, and nonmanual signals are often incorporated. Poems can incorporate the order of numerical sign handshapes. For example, a signer can tell a poem from 1 to 15, incorporating signed words that use each number's sign handshape/movement.



SIGN HANDSHAPE STORY

Shaquille DeGuzman, a Filipino Deaf storyteller, tells a basketball story in Filipino Sign Language using only one handshape - 5.



NUMERICAL POEM

The Deaf students in an early childhood education classroom tell an ASL numerical poem using the numbers 1-5. (Timestamp: 1:07-1:26)



NUMERICAL STORY

Shaquille DeGuzman tells a story about a typhoon incident using Filipino Sign Language numbers from 10 down to 1.



VISUAL VERNACULAR

Ian Sanborn, a Deaf visual storyteller, uses visual effects and classifiers to tell a story about a caterpillar's journey to becoming a butterfly in ASL.

Examples of signed language literature videos:



COMEDY

Deaf signers tell deaf jokes in American Sign Language.



DEAF EXPERIENCE

A signer tells a story about a deaf coal miner in American Sign Language.



COMEDY

A signer tells a funny story about King Kong (fictional giant gorilla) who is deaf.



DEAF/HEARING DIFFERENCE

A signer tells a story about a deaf driver who picks up a hearing hitchhiker.

Guidelines for Sign Language Translation of a Written Story

Sign language translation of a written language is a complicated process. Further, signers may switch from natural signing to a manual code for a written language without realizing it, particularly in formal situations (such as in front of a camera, when producing materials for publication, or when hearing people are present). Therefore, if natural signing is desired, producers must take extra precautions during filming to achieve the desired result.

Sign language translation of a written language is a complicated process.

Tips and Strategies for Sign Language Translation

Whenever written texts are translated into the target signed language, care must be taken to ensure the translation conveys the same information, at the same level of language. Although no two translations are exactly the same, they can convey the same information. Consider the written text's structure, intent, and vocabulary in order to translate it into the target sign language with its equivalent structure, intent, and vocabulary. This does not mean the structures of both languages should be the same. Some languages share similar structures; some use different structures.

The goal is to convey the same information.

Consider the original written story's intent.

Individuals with limited knowledge of their sign language are more likely to map their signed words onto the form and structure of the written texts. This might lead to distortion of the story's intent, a common occurrence with sign language translation of a written text, especially when the translator does not understand the written text's intent and/or have limited understanding of the signed language's structures. This sign-mapping onto the form and structure of the written text is called the superficial strategy. Considering the background and skills of deaf sign language translators in advance will help avoid this distortion.

Every individual has a unique upbringing in an environment that helped foster their language development and background knowledge. Translation skills depend on the individual's experience and how they embody the information based on their view, physical experience, brain maturity, social interaction, written and signed language fluency, and translation skills, including cognitive processing. The decision of how to translate concepts from the source language to the target language depends heavily on their knowledge of the subject and their experience. Their language use depends on how they visually evoke the concepts in their minds. Their construals of concepts in their minds differ from that of other translators. To provide deaf children access to their language and promote language development in their sign language, we must provide them with an accurate language deaf model of their sign language. Anything less would cause loss of sign language nuances that are seen in fluent deaf signers.

The use of deaf translators, rather than hearing sign language translators, who are fluent in their sign language and have a good understanding of sign language structures, is mandatory/imperative/necessary to avoid this loss of sign language nuances.

Translators are strongly encouraged to convey the written word's meaning in their sign language first.

Some sign languages worldwide have manual alphabets that map to their country's written alphabets or scripts. Individuals who use those sign languages often have a sense of urgency that each written word should be fingerspelled if there is no signed equivalent for the word. Fingerspelled words are cognitively complex, as they represent written words letter by letter or script by script. Although there are studies that show Deaf teachers are more likely to use fingerspelling in their teaching as opposed to hearing teachers, the teachers include word meanings through concise expansion in their sign language for meaning-making fingerspelling-print association. While fingerspelling has its purpose to map onto the written word form, translators are strongly encouraged to convey the written word's meaning in their sign language first and then follow that with fingerspelling whenever necessary. This reinforces conceptualization, that is, to think of word meaning for translation.

For children's books, there are visual illustrations that the translator can use to aid their sign language translation, breathing life into stories. The translator can use visual cues from the illustrations in the book to create a sign language signing space. Depending on a sign language's structures, the translator can set up the space to show location and movement for the noun(s) and the verb (e.g., a deaf girl walks to the school.). Most sign languages use modifications in nonmanual markers and movements with a range of intensity as adjectives and adverbs (e.g., a deaf girl walks slowly to the small school.). The sign language verb, "walk," might show a slower movement and a relaxing face expression. Depicting the information in the same manner in its intent and vocabulary is critical.

Use visual cues from illustrations in the book.

For story translation, the translator might want to consider the accessibility range. The range runs from "blurry" where the information is not accessible and comprehensible to "clear" where the information is accessible and comprehensible. The purpose of delivering a story in a language is to have students read or view it at their word level, and at the same time, introduce them to new words and/or concepts in the story. Some considerations for visual accessibility and young viewers include clarity of signed concepts and fingerspelling, word/sentence density and complexity, and noun identification. Related to density and complexity, in most languages, word/sentence density and complexity increase as children get more fluent in the language. Concepts in sign language can be formed as words, phrases, and sentences. Those concepts become more dense, complex, layered, and specifically

progressive from preschools to high schools. Those progressive concepts (progressive word choice for general and/or specific meaning) are dependent on the context and formed with phonological, lexical, morphological, semantical, syntactic, and discourse features.

For example, some sign languages have sign modifiers (e.g., a degree of intensity range of facial expression, movement, and /or handshape) that incorporate adjectives and adjectives in sentence structures. Some sign languages use body shifts to depict directions, perspective, and dialogues, among others. Those shifts are part of the sentence structures. When creating a story in, or translating a story into, a sign language, the signer has to consider how to present it at the grade level.


Deaf children must be able to view a story that is clear and accessible, including clear signed concepts and fingerspelling.

Young deaf children in early childhood education, preschools, and early primary schools like repeated noun identification to help strengthen their visual arrangements of nouns.

Lastly, noun identification is a method that the signer uses to help viewers become aware of nouns in the story context. For example, in a dialogue between a dog and a cat, the signer might use a space to set up two animals by identifying each animal first and then use a classifier for the animal as a referent in the space. By identifying the animals, the viewers are able to create their visual arrangements of the referents. Using the dialogue between the dog and the cat example, the signer would repeat noun identifications of the animals (e.g., DOG with the left body shift (or pointing to the right), dialogue; CAT with the right body shift (or pointing to the left), dialogue; DOG with the left shift, dialogue; CAT with the right shift, dialogue; so on, as the signer continues with the dialogue.

Older students would not need repeated noun identifications as they are more fluent in retaining the visual arrangement of nouns in the story context. Again, the goal is to make the story clear, accessible, and comprehensible. Sign language storybook evaluators can use an accessibility range (i.e., clearly accessible to unclear/inaccessible) to determine whether or not the story is optimally accessible for young viewers.

STANDARDS SUMMARY: Standards for Creating or Adapting Content: Sign Languages and Written Languages

		MINIMUM STANDARD	SILVER STANDARD	GOLD STANDARD
Reading Levels and Grade Appropriate Content	The written content is appropriate for grade reading level.			
	The written content includes new vocabulary, phrases, or sentence structure that go beyond the grade level for scaffolding.			
Viewing Levels and Grade Appropriate Content	The signed content is appropriate for grade viewing level.			
	The signed content includes new vocabulary, phrases, or sentence structure that go beyond the grade level for scaffolding.			
Sign Language Storytelling	Deaf-centric storytelling is captured in the storybook.			
	Storytelling includes deaf-centric themes or genres (e.g., rhymes, handshape, numbers, etc.).			
Language Translation	The translated content shows equivalent meanings.			
	The translated content uses proper vocabulary based on grade levels.			

Creating or Adapting Content: Story Development

CHAPTER

4



Credit: RIT/NTID,
Papua New Guinea

Story Development

Deaf Experience Content

Incorporating deaf experience content—including deaf information such as deaf characters and sign language conversations—in sign language storybooks is important. Depicting deaf characters positively

and accurately in children’s stories promotes awareness and appreciation in deaf and hearing readers/viewers (Golos & Moses, 2013).

Similar to hearing people, deaf people are diverse and exist in each and every populated country. Deaf people are members of various groups based on ethnicity, gender, religion, sexuality, or disability. Through the lens of empowerment (“Deaf Gain”), deaf characters in stories should show their unique qualities and personalities as they navigate different situations and environments. “Deaf Gain,” in opposition to “hearing loss,”⁹ includes different ways in which the existence of deaf people and sign languages throughout recorded human history have benefited society at large (Bauman & Murray, 2014). One such example is Konstantin Eduardovich Tsiolkovsk, who became deaf when he was young and was revered as the father of rocketry and cosmonautics in Russia for his contribution to science. There are stories about deaf people who are the first in their family to go to college as their being deaf opened the door to educational and career opportunities. Otherwise, they would follow their hearing family’s educational and work cycle. Developing biographies of local or international deaf people is also crucial. Deaf people, sign languages, deaf cultures and deaf communities contribute to the diversity of the human population and society at large. Through representation, Deaf readers/viewers develop pride and connection to Deaf cultures and deaf communities, and hearing readers/viewers develop awareness and appreciation of diverse populations and cultures.

In many existing books, deaf characters are defined by hearing people, and as such, their voice gets taken away. They are defined from a deficit-based mindset where the loss of hearing should be fixed. Instead of applying a deficit-based view to deaf characters, a cultural heritage lens should be used when developing deaf characters.

⁹ “Hearing loss” is often associated with a pathological perspective of deafness. Deafness is viewed as a condition that needs to be fixed with medical intervention or that is the cause of language and cognition delay, personal and social isolation, behavioral and communication problems, and a can’t-do attitude. An alternative view of deafness is recommended from a cultural perspective — that deaf people are contributing members of society and represent minority populations, the Deaf Communities, sign languages, and Deaf cultures. This perspective recognizes the ability of people who are deaf to make unique and important contributions not despite their deafness but because of it.

Through the lens of empowerment (“Deaf Gain,” in opposition to “hearing loss”), the unique qualities and personalities of deaf story characters should be shown as they navigate situations and environments. Using this lens, the different ways deaf people and sign languages have contributed to society at large and different fields of knowledge can also be highlighted.

The concept of “Deaf Gain” can also be incorporated into children’s stories with cultural messages, including how deaf people perform daily tasks visually, such as using a light or stomping on a wooden floor instead of calling to get a friend’s or a pet’s attention. Like hearing characters, deaf characters in stories should show their thoughts, perceptions, and identity as they learn, think, problem solve, and navigate through plots. Golos & Moses (2013) encourage stories that foster positive outcomes as they create favorable impressions of deaf people for deaf and hearing readers/viewers. Images (illustrations) should depict signs and/or sign motions when there are dialogues.

A deaf character in a story can be a person, an animal, or a thing. A bird in a story can use its wings to communicate in sign language, for example. Similarly, a tree can use its branches to communicate in sign language or a bus can use its doors.

Authors do not have to explicitly identify a character in a story as being deaf. The author could also just show characters using sign language in the story through illustrations. Character development is crucial to story enjoyment so viewers/readers can see humanity in the characters.

Deaf people must be included on the story development team to ensure that deaf characters are portrayed accurately. Moses, Golos & Holcomb (2018) recommend that deaf people take the lead on story development and sign language storybook development involving deaf characters. The deaf

person could be named an author of the story. Having more Deaf authors helps encourage deaf children to write, and it reduces the societal and educational perception that deaf people are not good at writing.



MENG MENG AND HER PET MONKEY

This story tells of a Filipino Deaf girl who receives a pet monkey for her birthday. This is based on a true story of one of the story authors.



THE HEART OF THE BANANA TREE

This story tells a Filipino Deaf boy who meets the Goddess of the Moon and shares his dream that everyone can sign.



THREE HEARING PIGS AND THE DEAF WOLF

This story retells the classic story, Three Pigs and the Wolf. In this story, the pigs are hearing and the wolf is deaf.



WIKIPEDIA list of storybooks involving deaf characters

Deaf Culture Folktales

Deaf folktales are stories about a deaf person or a deaf object based on the Deaf Community’s successes, trials, and culture. Deaf folktales bring diverse Deaf communities together in an authentic and relatable way, while also validating one another's shared experiences and struggles. Sign language storytelling, folklore, and jokes are a way for the Deaf Community to pass on their culture to younger generations. They are a means of self expression and identity, and a celebration of their language and community together.



An example of a Deaf folktale from the United States is Timber! (in American Sign Language)

Here is a generic version of the Timber story as it can be told many different ways:



A lumberjack yells to a tree: ‘Timber!’ The tree falls down. But the next one will not fall down. The man yells some more, but the tree will not fall. Then the man calls for a doctor. The doctor monitors the tree with a stethoscope and tells the man to attach a hearing aid to the tree as it is hard of hearing. The tree is given the hearing aid and the man yells to the tree: ‘Timber!’ and the tree falls down. The same happens with the third tree: the man yells at the tree, but the tree will not fall. He again summons the doctor. The doctor monitors the tree with his stethoscope and announces that the tree is deaf. The man has to gesture to this tree. The lumberjack then fingerspells T-I-M-B-E-R and the tree falls.”

Deaf Family Life

Watching videos that show how sign language is used naturally in various daily activities (e.g., talking, playing games, eating dinner, etc.) can be very helpful for deaf children and their hearing families. Consider creating stories about how a deaf family deals with daily life at home, work, and in various communities (i.e., deaf communities, neighborhoods, and school communities). Such stories can show deaf people are humans like others.



This video shows a deaf family in Kabul, Afghanistan. The family members talk about their jobs using Afghan Sign Language.



This video shows deaf parents doing morning-to-night daily routines with their two daughters. The purpose of this video is to reinforce language learning related to daily life tasks.



This video shows a story about a hearing daughter of deaf parents who tries to find a solution to her situation. The girl uses cross-cultural tools to solve the situation.



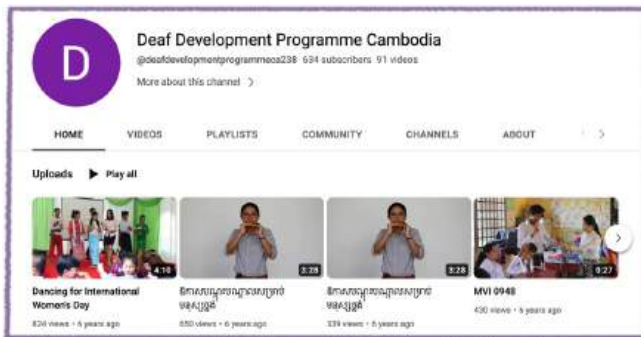
This video shows the lives of a deaf New Zealand family who use New Zealand Sign Language.



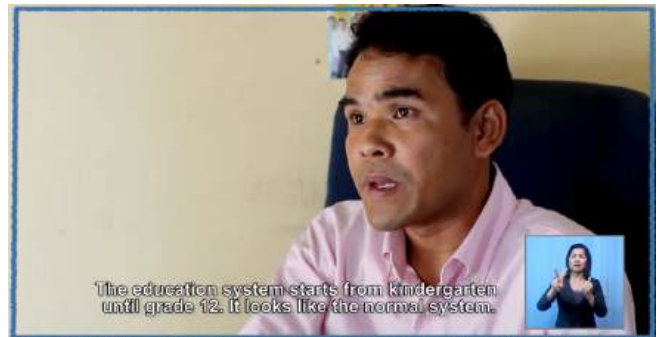
This video shows a dinner chat between a 24-month old deaf child, Ava, and her hearing mother. They use British Sign Language.

General Information for Deaf People

Deaf children need access to general information (e.g. a deaf firefighter sharing information about fire safety) through their natural language — that is, their indigenous, regional, and/or national sign language. Sign language videos on general information should include vocabulary. Such videos can be used as extension learning opportunities for deaf children to connect their sign language lessons to the information to build background knowledge. Video length can be from one sentence to several sentences. For example, in Cambodia, the following general information videos are available:



Deaf Developmental Programme library of Cambodian Sign Language videos on current events, informationals, and special holidays.



Krousar Thmey informational video in Cambodian Sign Language that allows deaf Cambodian children to learn just like any other child



YouTube Cambodian Sign Language videos of a deaf female teacher explaining different symbols in the country's flag

STEM Content

Deaf and hard of hearing people have contributed to science, technology, engineering, and mathematics (STEM) for the past few centuries. They have discovered chemical elements; developed mathematical equations for scientific applications; identified and cataloged animals, plants, stars and comets; and held hundreds of patents (Lang, 1994; Lang and Meath-Lang, 1995; Lang & Santiago-Blay, 2012). Providing stories about STEM can increase deaf children's awareness

and interest in these topics. The proportion of deaf people in STEM is very small (less than 0.2 percent, which is less than two out of 1000 deaf people or one out of 500 deaf people) (Solomon, 2012).¹⁰ Introducing STEM to the next generation of deaf children is critical, and bilingual story books can be their gateway into the world of STEM.

Story content developers are encouraged to incorporate deaf characters in stories about STEM. Again, deaf characters should be diverse in terms of ethnicity, gender, religion, sexuality, or disability. Inclusion could be strengthened by including a deaf female astronaut, engineer, mechanic, inventor—or a little deaf girl who likes to build things from natural objects—in storybooks. Such stories promote awareness and build a can-do attitude in hearing and deaf female readers/viewers who want to learn about and pursue careers in STEM and challenge other’s misconceptions to realize the potential for deaf or hearing females to participate and achieve in STEM.







The Deaf STEM Club story is about two deaf female students who want to create a club to learn about science, technology, engineering, and mathematics.

Contemporary Content

Contemporary stories are different from folktales. A contemporary story is set in current times. People share personal stories, create new stories, or modernize past stories. Contemporary stories should be delivered in sign language for deaf children to learn about today’s world. Signed videos of deaf people telling stories that happened recently or some years ago can make a good addition to a library for deaf children as it supports their learning about current events.

¹⁰ The proportion of hearing people in STEM ranges between 11 and 15 percent (11 out of 100 and 15 out of 100).

STANDARDS SUMMARY: Standards for Creating or Adapting Content: Story Development

		MINIMUM STANDARD	SILVER STANDARD	GOLD STANDARD
Deaf Experience Content	A story includes deaf character(s) as a minor character(s).			
	A story includes deaf character(s) as a main character(s).			
Contemporary Content	A deaf story includes real or fictional deaf character(s) with identifiable characteristics (sign language, school name, hearing equipment).			
	A story incorporates sign language rhythm or creative use of sign language features (e.g., handshape, movement, facial expression, and manual alphabet).			

Video Production

CHAPTER

5



Credit: eKitabu

Signed videos must be produced with the same high quality — including design and editing — used when creating written materials. In filming, every detail matters. This section covers the elements required to produce high quality sign language videos, which range from handling a video camera to the production crew and talent (signer), the environment, editing, and more.

Handling a Video Camera



The camera must be set up in a steady position, using a tripod or a solid surface to avoid shaking resulting from hand holding a camera.



Any "anti-shake" capability on the camera should be turned off. The fast movements of hands in sign languages can confuse these mechanisms, causing the signer's image to bounce around in the recording.



Avoid using the camera's mirror effect (in which the signing space and the dominant hand may end up inverted, or opposite). For example, a right-handed signer becomes a left-handed signer in the video due to the camera's mirror effect. It can be resolved by turning off the mirror effect feature in camera settings.



Credit: RIT/NTID, Fiji Team

Video Framing



Shoot the video in a landscape position (wide-screen/ horizontal) not portrait (vertical) position.



Keep the camera level with the signer's chin. The lens should be pointing straight ahead, not angled up or down. Place the camera at least 10–15 feet (3–5 meters) away from the signer to avoid the hands looking unnaturally large when they are extended toward the camera. Zoom in or out to get the proper framing.

The view through the camera lens should show appropriate signing space:

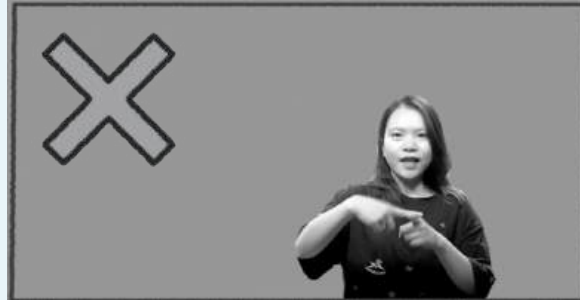


Figure 9. Video Framing is too far away from the camera or the camera is zoomed out too far.

Avoid filming the signer's full body from head to toe or having too much space above the signer's head as shown in Figure 9. This leaves too little space for the signer to show the sign language and the viewer to see the sign language.



Figure 10. Video framing is too close to the camera or zoomed in too close.

Avoid setting up the camera too close to the signer or zooming in too close as shown in Figure 10. This results in cutting off the signer's hands, arms, or head and there is not enough space below her arms which means some of her signs may be cut off and will not be viewable.



Figure 11. Video Framing at the right distance.

Ensure that the signer stays within the signing frame from the top of his/her head to the bottom of his/her waist as shown in Figure 11. The framing needs to show a couple of centimeters of space above the signer's head and the viewer should be able to see the entire signing space.

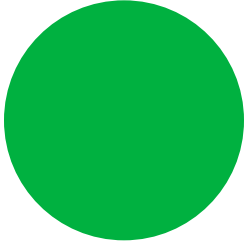
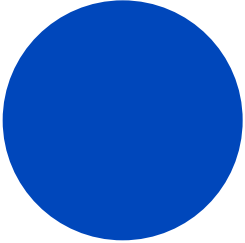


Credit: RIT/NTID,
Fiji Team

Background and Lighting

Use a plain, solid cloth or a painted matte backdrop that is free of designs so the signer’s hands can be clearly seen. Remove any physical objects in the background that may be visually distracting.

A uniform, chroma key green or chroma key blue background is important if superimposing the signer on a variety of different illustrative backgrounds (“green-screen technique”) is desired in final production. If implementing the green screen technique, the signer must not wear anything that is the same color as the background, as any items the same color as the screen will appear as transparent post-production.

	CHROMA KEY GREEN Hex #00b140 RGB 0 177 64 Web #009933		CHROMA KEY BLUE Hex #0047bb RGB 0 71 187 Web #0033cc
---	---	--	--

Using story images as background is permissible as long as the images do not distract the child from viewing the signed language.

Use sufficient lighting to clearly see the signer’s signing, including the head and hands. Bright or natural light is best.

Ensure the signer is not standing in front of any light sources (e.g., lamp or window during daylight). The camera, often set on auto-exposure, will compensate for the bright light by creating a shadow effect, making the person on camera very dark and difficult to see. The solution is to either move away from, cover, mask, or dim the bright light for better lighting on the signer.



Figure 12: Three point studio lighting system.

Figure 12 shows a recommended three-point studio lighting system. This includes one key light above the head and to one side of the camera; a second fill light below the head and on the other side; and a third back light behind the signer and illuminating the background to remove any shadows.



Credit: School-to-School International

Production Crew and Signer

Production Crew

Featuring deaf people in signed videos is essential, as they provide a natural sign language. Using hearing interpreters as signers is strongly discouraged, as the vast majority of them are second language learners and research has shown second language learners have language delays and production errors in their second languages. The impact of their signed language delays/errors (e.g., consistent incorrect sign production, incorrect use of grammatical features, and limited word choices) can adversely affect deaf children's sign language development.

Video production teams should include sign language experts (who are preferably deaf) to ensure that the sign language is semantically accurate. The gold standard is that all people present in the room when signing are deaf to preserve the integrity of the signing and to ensure that the signer does not unconsciously switch to a signing style that is customarily used for communicating with signing hearing people.

Video production teams should also include a deaf team member responsible for observing and evaluating the signing as it is being filmed. This person needs to be aware of the grammatical nuances between different signing varieties and ensure that the desired variety is represented in the film. This allows for immediate remediation and a reshoot should the signer use a construction that is not desired, ensuring production budget and timeline efficiencies.

The signer(s) must be recognized for their authorship or translation efforts in a storybook. One way is to have the signer introduce themselves by signing their sign name and then fingerspelling their name within the video to accompany the written attribution.

Signer

Signer's Appearance



The signer should wear solid colored clothing without any distracting visuals. A general rule of thumb for signed videos is to wear a solid color that contrasts with the signer's skin color (i.e., signers with darker skin tones should wear light colored clothing, and signers with lighter skin tones should wear dark clothing). Culturally representative clothing is permissible as long as it adheres to the standards outlined above (solid materials without any distracting visuals).



Consider removing jewelry or glasses that might cause distracting reflections, movement, or flashes of light. Small studs are preferable to large ear or nose rings. Rings on fingers can be removed or covered with tape that matches the signer's skin tone. Any obstructions to the signer's face (e.g., sunglasses) should be removed to allow maximum visual access to facial expressions. For instance, some cultures require face coverings. Solicit input from indigenous deaf communities to help appropriately address and honor cultural practices while ensuring high quality sign language delivery in a video.

Eye Contact and Shifts

One of the most valued characteristics in sign language is eye contact. The signer should be sure to maintain eye contact with the camera to sustain a connection between the signer and the viewer as shown in Figure 13. Eye contact is similar to the use of a person’s name in spoken conversations. As such, the signer must look into the camera and not away from it. Looking into the camera is how the signer makes eye contact through video with the target audience. Without eye contact, the signer will quickly lose the audience.

While delivering a story in sign language, the use of eye shifts (not looking into the camera) is allowed whenever appropriate. For example, a signer could look at the imaginary paper in front of her body and sign “draw” as a first person narrative for “a person draws on a paper.” Another example would be to illustrate a conversation between two characters. While shifting their shoulder to depict one of the characters, the signer would look at the other imaginary character to her right or her left, and vice versa.

Signer Frame Position

Middle of the Frame / Rule of Halves

The signer can be in the middle of the frame, as shown in Figure 13, as long as the signer is not blocking a critical part of the background image. This framing can be used to dramatize a story or for sign language rhythms.



Figure 13. Eye Contact and Middle of the Frame / Rule of Halves Frame Position. The signer is positioned in the middle of the frame and holds eye contact with the viewer.

Side of the Frame / Rule of Vertical Thirds

In the rule of vertical thirds method (where what is seen in the viewfinder is divided into thirds vertically), the signer is placed at one of the vertical one-third of the frame, allowing space for a background image. Instead of having the signer stand in the middle of the frame, as shown in Figure 13, move the signer to either the left third, as shown in Figure 14, or the right third, as shown in Figure 15, depending on which is the signer's dominant hand. The signer should be placed on the left third of the viewfinder if the signer's dominant hand is their left hand or the right third of the viewfinder if the signer's dominant hand is their right hand.



Figure 14. Rule of Thirds Frame Position. A signer whose dominant hand is left should be positioned in the first (left) third of the frame.

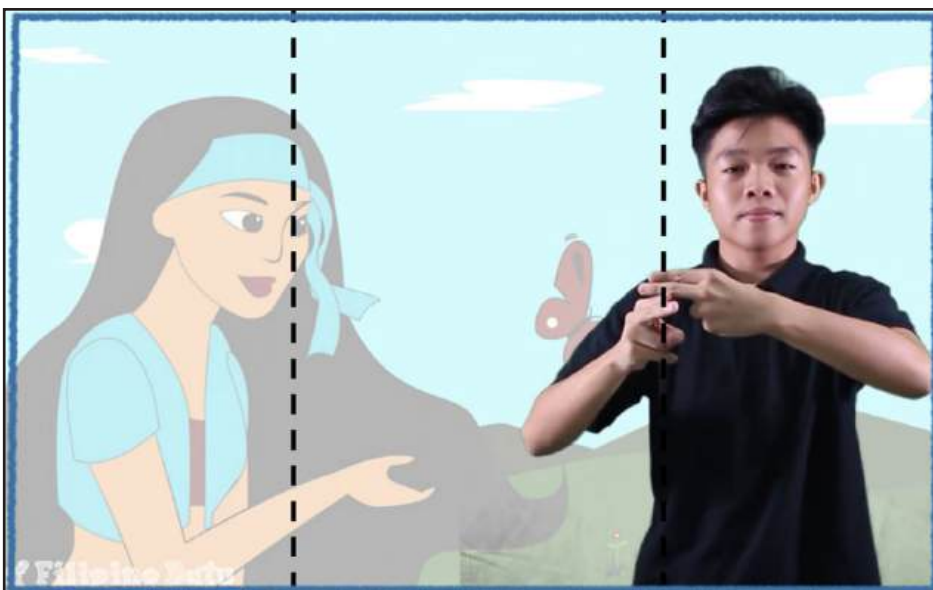


Figure 15. Rule of Thirds Frame Position. The signer whose right hand is dominant should be positioned in the second (right) third of the frame.

Angle and Depth

For better use of signing space in the video, the signer's body should be turned 20 to 30 degrees away from the camera to maximize the signing space in terms of depth, as shown in Figure 16b. While positioning the signer's body perpendicular to the camera, as shown in Figure 16a is acceptable (and common) in sign language videos, Figure 16a does not show the depth (away from the body) of the sign.

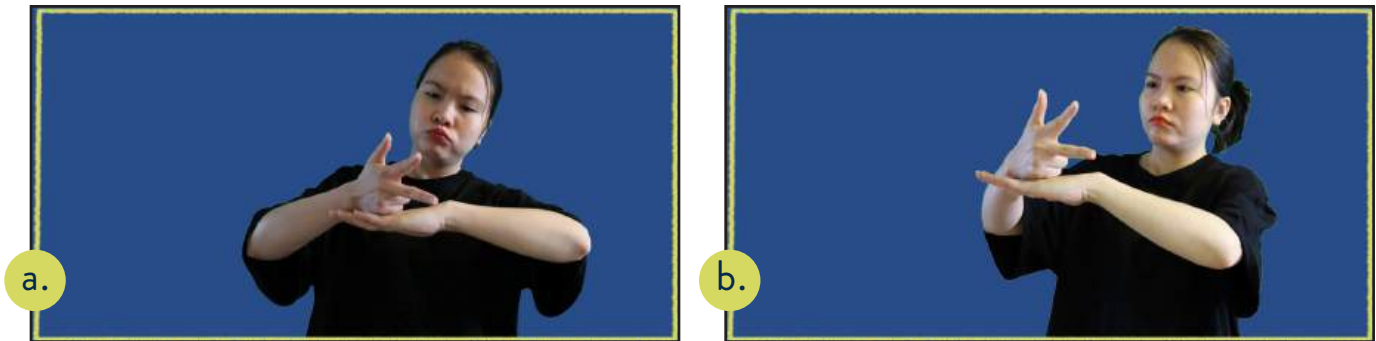


Figure 16. Angle and Depth: Because the signer on the right (b) has turned her body 20 to 30 degrees away from the camera there is more depth in her signs than the signer on the left (a), who is perpendicular to the camera.

Video Editing Programs

To create a final product from all the footage, videos need to be edited. There are numerous video editing software programs available for free or paid subscription. The most popular program is Acrobat Premiere Pro software. Additionally, Mac computers usually come with iMovie software. There are a growing number of open-source and free video editing software, such as:



OpenShot Video Editor

is a great choice for beginners and advanced editors alike.

Shotcut Video Editor

is suitable for editors at various skill levels. There are also YouTube channels which provide many tutorials.

Vidcutter for Basic Editing

has small, simple, user-friendly editing functions like trimming and cutting videos.

CapCut Video Editor

is easy to use on smartphones. It has drag and drop features and allows image addition to the video and/or in the background without the requirement of a green or blue chromo.

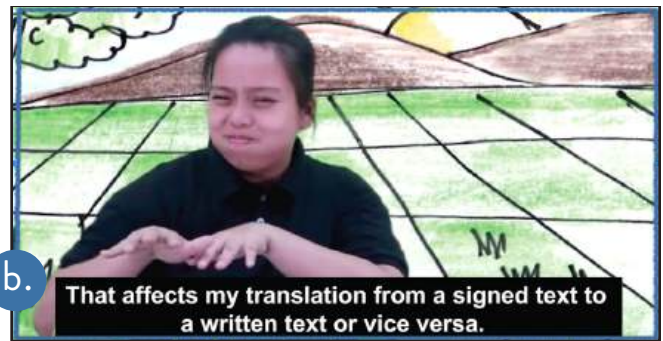
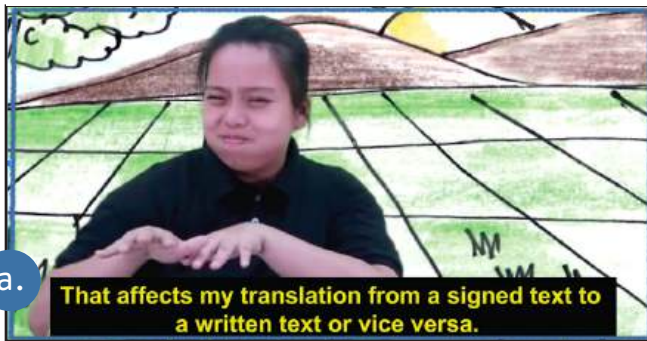
There are also open-source and free video file conversion software available for use, including Handbrake.

Handbrake converts video from nearly any format to a selection of modern, widely supported codecs.

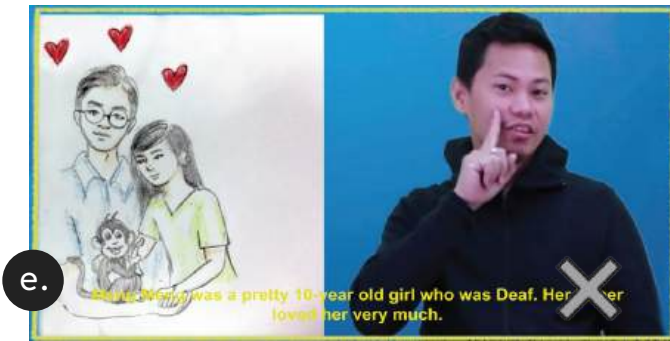
Captions and Subtitles

If captions or subtitles are included in the video, ensure they are properly positioned so that they are clearly visible for reading (see Figure 17 a-d). Figures 17 e-h show some incorrect uses of the caption/subtitle, such as illegible fonts and incorrect placements. Font type used in a storybook should be clear and legible. Cursive and funky fonts are not acceptable (see Figure 17 f, for example). If possible, users should be able to adjust font size for legible reading.

Never use moving text, text that appears in the horizontal middle of the screen, or text that covers the signer. When intended text appears in the video-based story, signing can either be frozen or set in slow motion to allow viewers to shift their focus to the text. Ensure the captions remain on the screen for the length of time needed to comfortably read them in their entirety. Be sure the font color used for captions highly contrasts with the background. To make captions more visible, add a black or white box behind the text (see Figure 17a-b, for example). Ensure the box and captions do not block the signer's signing. Additionally, because the video production focuses on sign language, written text within the video should be kept to a minimum. Figure 17 c-d shows an independent section for the captions.



Figures 17a-d. The captions/subtitles are positioned properly and are clearly visible. In (a) the yellow font text on the black box, (b) the white font text on the black box, (c) black font text on the white box, and (d) the white font text on the black box below the signing video allow for easy reading without blocking the signer.



Figures 17e-h. The caption/subtitle are not positioned properly and are not clearly visible. In (e) the yellow font without the black box is hard to read. In (f) the white font text cursive formatting is hard to read. In (g) the black font text without the white box can be difficult to read and is not positioned at the bottom of the screen, where recommended, and in (h) the white font text without the box background is hard to read.

Transition Effects

Be sure to start recording at least three seconds before the signer begins signing and keep recording for at least three seconds after they finish signing. This allows space for editing and transition effects without creating abrupt beginnings and endings to the signing. Do not use moving transition effects such as blurring or spinning into the next video segment. A black fade that is easy on the eyes and has a clean look is recommended.

Animation Effects

Some image animations can be helpful, but be sure to show the animation before the signer enters the frame. If the signer is already in the frame, the signer should pause while the animation is played to allow the viewer to focus on the animation. The signer can also direct their eyes—or point their hand—toward the animation to help direct the viewer’s attention to it, enabling the viewer to follow the animation.



Credit: The Asia Foundation, Nepal

Video Format

A large video file size can be problematic and result in difficulties uploading the video to a platform.

	YOUTUBE	VIMEO (BASIC PLAN)	FACEBOOK
VIDEO LENTH	15 minutes	-	240 minutes
FILE SIZE LIMIT	2 GB	500 MB per week	10 GB

Video format specifications of different platforms are important to consider before filming so that video files are created that meet the specifications of the platforms where videos will be disseminated.

Reducing Video File Size

Several ways to reduce the video file size before exporting from video format to an MP4 file are outlined in this section.

The minimum standard is using a recognized set of parameters (resolution, frame rate, codec, and container format) for presenting the videos, to ensure the maximum number of devices can display it.

Adjusting the Frame Rate

	STANDARD/OPTIMAL RATE
Film	24 FPS
Television	30 FPS
YouTube	29.97 FPS
Instagram	30 FPS minimum
To Capture All Signing Details	25 FPS minimum 50 or 60 FPS is better for fast movements

Generally, frame rate, measured in frames per second (FPS), is usually 24 FPS for film and 30 FPS for television. Choose the resolution or frame rate based on what is optimal for the device on which the video will be played. For a standard YouTube video, the optimal rate is 29.97 FPS, although 24 FPS is allowable. Instagram requires a minimum of 30 FPS.

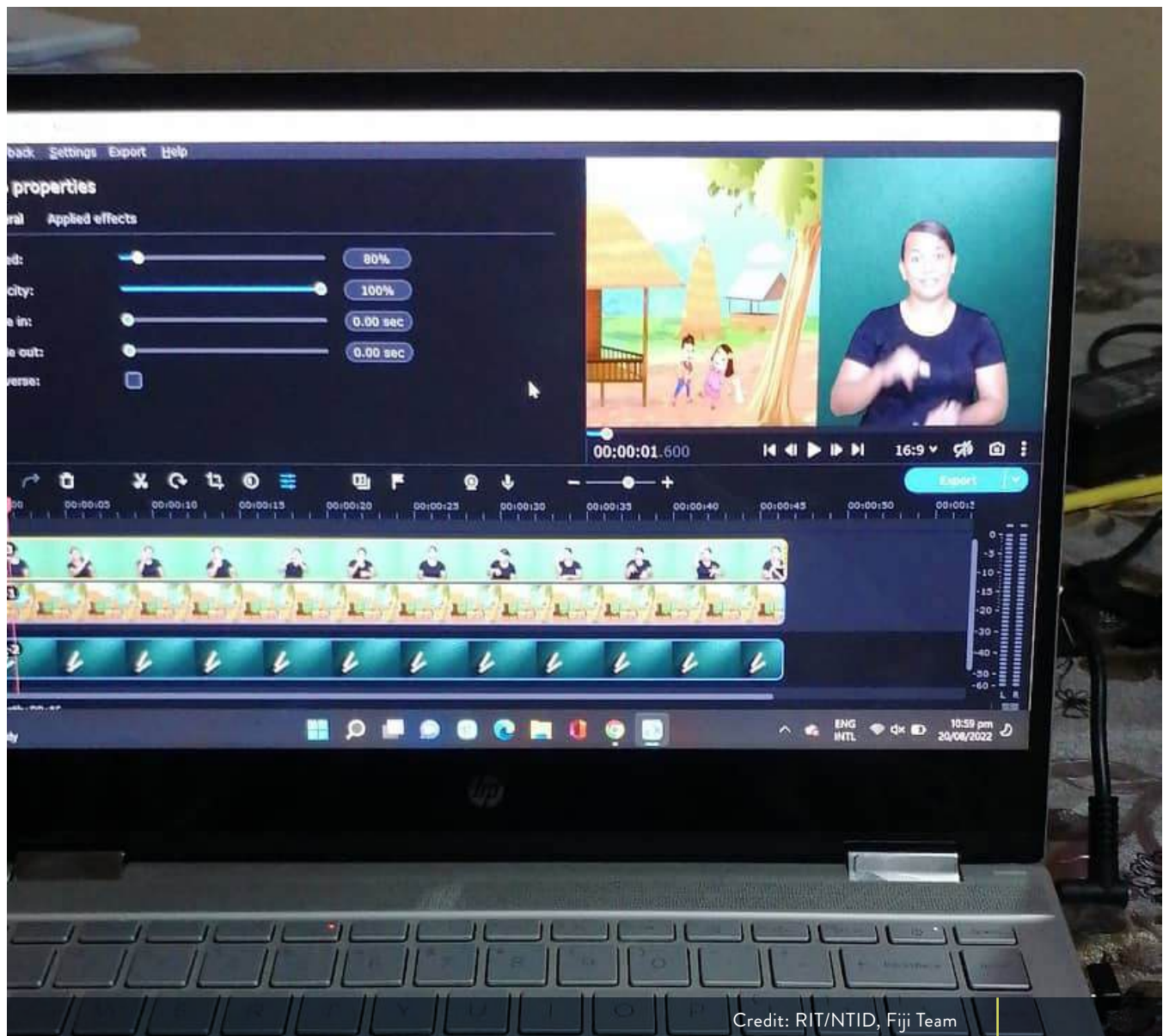
To capture all the details of signing, 25 FPS is the minimum acceptable frame rate. Lowering that rate will reduce the file size, but if the video captures significant movement, lowering the frame rate too much will result in motion blur. If the video involves a lot of fast movements (e.g., fingerspelling) then 50 or 60 FPS is better.

Adjusting the Resolution

	OPTIMAL RESOLUTION
YouTube (HD)	1080px (selecting 720px will decrease video file)

The optimal resolution for a High Definition (HD) YouTube video is 1080p. If 720p is selected, the video file size will be decreased. If viewers are using phones, tablets, or laptops, this may be imperceptible to the viewer. The resolution in the final product can vary, depending on the intended device on which the video will be displayed and its allowable resolution. For example, it may be possible to compress a video to 480p if the display device only has 500 pixels of height for video display. This can greatly reduce the size of the video or ePUB if it is delivered through internet download.

Constant, rapid technology development and display devices may lead to higher resolution availability in the future thus an intentional approach to balancing these competing concerns that affect file size is required.















Editing Excess Footage

If video compression isn't enough, consider decreasing video size by trimming excess footage. To remove all extra footage, trim the beginning of a clip by clicking the orange or yellow handle on the left side of the clip and dragging it to the right. To cut off the end of a clip, just reverse the process by moving the right handle to the left.

Speeding up the action

There is an alternative way to reduce file size. Speed up the action and reduce the video's length, by using the Speed button on the right bar (or bottom toolbar if you're using the mobile app). Use the Range slider to pinpoint the part to speed up, and then toggle the Range Speed slider. The Maintain Audio Pitch box is checked by default to keep the audio from becoming too distorted.

STANDARDS SUMMARY: Standards for Video Production

		MINIMUM STANDARD	SILVER STANDARD	GOLD STANDARD
Handling a Video Camera	The video camera's mirror effect is turned off.			
Video Framing	The signer is positioned perpendicular to the camera and in the middle of the frame or a vertical third of the frame.			
	The signer is positioned 20 to 30 degrees away from the camera and either in the middle of the frame or a vertical third of the frame. This maximizes the signing space in terms of depth.			
Background and Lighting	The background is clear of visual distractions.			
	The lighting on the signer is proper, and there is no light reflection on the screen.			
Production Crew and Signer	The filming crew includes at least one deaf spotter for language delivery and at least one deaf supporter for sign language creation and/or translation.			
	All of the filming crew members are deaf, and no hearing persons are in the room, to ensure natural sign language delivery.			
Captions and Subtitles	Captions or subtitles are legible.			
	Captions or subtitles are customizable to the reader's liking.			
Transition Effects	None of the transition effects are distracting to the viewer.			
	The transitions allow time for the viewer to attend and view the signed text.			
Optimal Device Use	Videos are created with a recognized set of parameters (resolution, frame rate, codec, and container format) to ensure the maximum number of devices can display them.			

Quality Assurance: Story Content Review Categories

CHAPTER

6



Credit: eKitabu,
Malawi

Story content quality assurance (QA) ensures that standards are met for a high quality sign language storybook, which ensures usage, adoption, and promotion by key stakeholders, such as schools and Ministries of Education. Much like the print publishing process, a step by step assessment and review of all story components is required to make certain the highest standards are met, which in turn, drives a strong user demand for more sign language book creation and strengthens the book chain.

When reviewing story content, conduct quality assurance on text, representation of self, developmentally appropriate language, and story aesthetics. In addition to conducting a thorough copyedit of the text— for

correct grammar, spelling, capitalization, punctuation, etc., ensure the readability of the text, such as the use of a legible font, adequate spacing and kerning between lines and letters, the use of familiar words, and the appropriate number of words per page for the targeted grade level.

PROPER REPRESENTATION OF SELF

Checking that the story content has proper representation of self, means that it has relatable characters, personal connections, and a story theme that can impact the reader. Child readers need to be able to relate to the story through its characters, connections, and themes. The reviewers also need to check word choices and sentence structures to ensure the language text leveling is developmentally appropriate for the child reader. In addition, reviewers must check the aesthetics of the story—such as the visual illustrations—for text-image connection, text placement, and easy-to-follow story progression. The story must be visually interesting to capture the attention of a child reader.



Credit: RIT/NTID PNG

Below is an evaluation form to use while conducting quality assurance review of the story content.

Story Content Review Categories

When conducting quality assurance to ensure high quality story content, consider the review categories in Table 5 and ensure the related questions have been successfully addressed:

Connections: The interests, environments, and life situations to which children feel connected	Does this story impact this age- or grade- level group?	<input type="checkbox"/>
	Are there interests, environments, and life situations in this story that will engage children?	<input type="checkbox"/>
	Will the children like a character in this story?	<input type="checkbox"/>
Intentionality of theme: The lessons to be learned, vocabulary applications, and story importance	Will children learn something from this story?	<input type="checkbox"/>
	Will children be able to explain the story to someone?	<input type="checkbox"/>
	Is it important that children learn the lesson in this story?	<input type="checkbox"/>
	Will they learn a skill from this story (this also includes social emotional learning)?	<input type="checkbox"/>
Relationships: The similarities and differences of characters in the story and what character identification is familiar to children	Is there any character in this story that looks like the targeted reader?	<input type="checkbox"/>
	Is there a relationship that the reader can understand (i.e., mother-daughter, a familiar setting) in the story?	<input type="checkbox"/>
	Will the reader learn about an opposite perspective?	<input type="checkbox"/>
Use of language: The story provides legible and proper language that can be understood by the reader	Is the child familiar with this specific vocabulary? Has this been taught to them?	<input type="checkbox"/>
	Is the language developmentally appropriate (frequently used) for this group?	<input type="checkbox"/>
	Is the font size, color, and style readable for children?	<input type="checkbox"/>
Expansion of concepts: The story provides an extension of content to learning and critical thinking	Will the children be able to extend the learning to a new concept?	<input type="checkbox"/>
	Does the story spur children to think independently about multiple perspectives?	<input type="checkbox"/>

**Table 5: Quality Assurance Evaluation
Sign Language Storybooks Story Content and Readability**

RATING


























 **FIVE STARS** if 90-100% of the content meets requirements of the category

 **FOUR STARS** if 80-89% of the content meets requirements of the category

 **THREE STARS** if 70-79% of the content meets requirements of the category



 **TWO STARS** if 60-69% of the content meets requirements of the category

 **ONE STAR** if 59% or less of the content meets requirements of the category

CATEGORIES	CRITERIA	RATING				
Readability of text	<ul style="list-style-type: none"> Font is easy to read and decipher Scripted words are clear Commonly used words are adjusted for child’s level Number of words match child’s level 					
Connections to text	<ul style="list-style-type: none"> Child has familiarity with words Words connect with pictures at developmental level 					
Representation of self	<ul style="list-style-type: none"> Characters are relatable to a deaf child Relationships are easily deduced Child understands the story’s theme and personal impact 					
Developmentally appropriate	<ul style="list-style-type: none"> Sentence structures match child’s development level Child can follow along at proper pace Story allows inquiry at developmental level 					
Aesthetics of story	<ul style="list-style-type: none"> Illustrations are visual and connected to story Words are spaced appropriately and clearly printed Story progresses on an easy-to-follow path 					

Comments:

STANDARDS SUMMARY: Standards for Quality Assurance: Story Content

		MINIMUM STANDARD	SILVER STANDARD	GOLD STANDARD
Sign Language Storybooks Story Content and Readability Quality Assurance Evaluation	All categories have at least 4 stars.			
	All categories have 5 stars			

Quality Assurance: Sign Language Review Categories

CHAPTER

7



Credit:
Unsplash.com

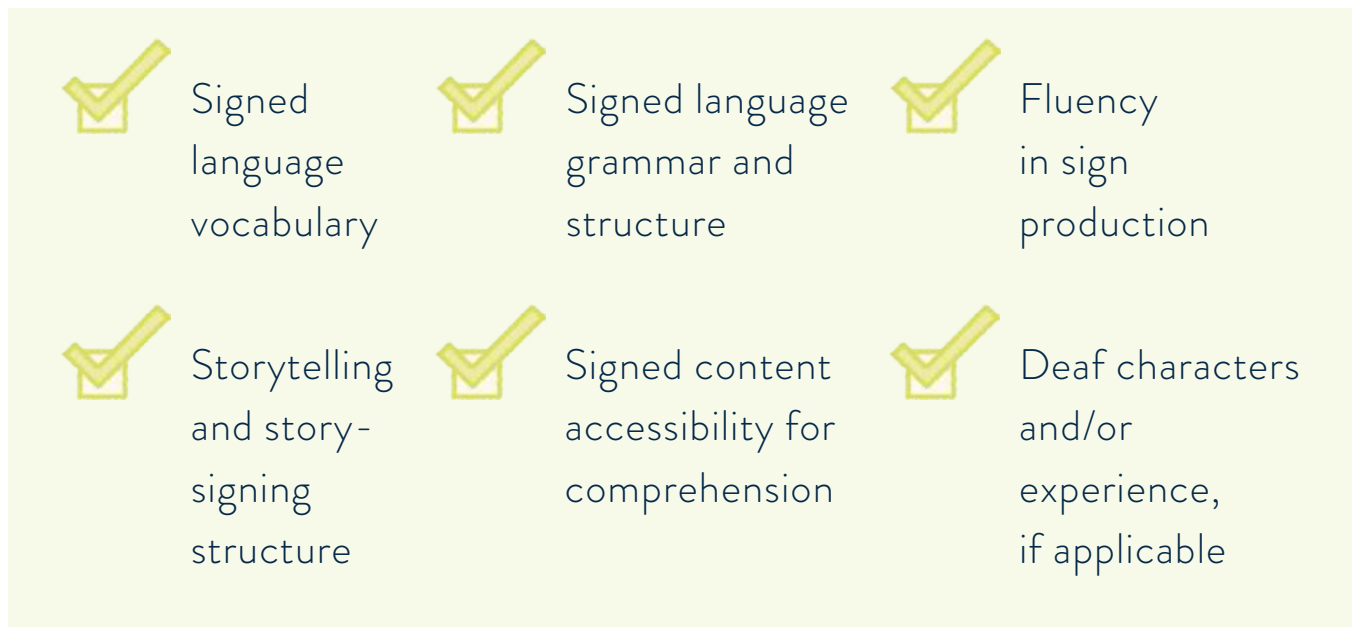
The Purpose of Quality Assurance of Sign Language Content in a storybook is to ensure:

- Accuracy of sign production
- Accessibility of sign language delivery
- Clarity of sign language delivery
- Developmentally appropriate progression of sign language leveling

Engaging reviewers who are deaf and fluent in the sign language used in the storybook is strongly encouraged.

Sign Language Review Categories

To meet the criterion of sign language story delivery, the reviewer must evaluate the story across six categories:






































For example, the reviewers must check the sign language delivery to ensure signing space and that it follows proper sign language storytelling structure including an opening, transitions from one scene to another, and an ending.

The reviewers are encouraged to check that the information presented is fully comprehensible for viewers. This includes areas such as the signer maintaining eye contact with the viewer and that there is no skin blending (e.g., fingerspelling in front of the signer's face). Also, the reviewers look at whether or not the signer's clothing color and pattern or their jewelry interfere with viewing. In addition, the reviewers check each video to ensure there is no visual interference with viewing.




Table 6 shows a suggested evaluation form and provides a description and example of each sign language category. Importantly, reviewers must be fluent in their sign language to use this form.

**Table 6: Quality Assurance Evaluation
Viewability for Sign Language Storybooks**

RATING						
 FIVE STARS if 90-100% of the content meets requirements of the category						
 FOUR STARS if 80-89% of the content meets requirements of the category						
 THREE STARS if 70-79% of the content meets requirements of the category						
 TWO STARS if 60-69% of the content meets requirements of the category						
 ONE STAR if 59% or less of the content meets requirements of the category						
CATEGORIES	CRITERIA	RATING				
Signed language vocabulary	<ul style="list-style-type: none"> Word choice is grade-appropriate The story has frequently used words Target signed words are included Sign production, or the proper use of linguistic features to make a signed word, is accurate Content vocabulary meaning is accurate 					
Signed language grammar and structure	<ul style="list-style-type: none"> The use of syntax and structure (verb + spatial relationship) is appropriate Sign modifications, including facial expressions, match adjectives/adverbs 					
Fluency in sign production	<ul style="list-style-type: none"> Signer maintains eye contact with the viewer, as appropriate, in the storyline Signer signs continually without awkward transitions or pauses within or between sentence to think. No false starts are present No self-corrections are present No repetition in a sentence is present 					
Storytelling and storysigning structure	<ul style="list-style-type: none"> Signer knows the story well Signer shows personalities of characters Signer shows interesting points of view for characters There are clear transitions between scenes Use of appropriate pacing (slow to fast) depending on the storyline No transliteration of the written story is present 					
Signed content accessibility for comprehension	<ul style="list-style-type: none"> Signed content (signing) is clear and easy to follow (less ambiguity) Noun identification provided in the storyline is appropriate If applicable, fingerspelling is shown clearly 					
Deaf characters and/or experience, if applicable,	<ul style="list-style-type: none"> Deaf characters and deaf communities are portrayed and represented properly Deaf cultural behaviors and tools are appropriate 					

Comments:

STANDARDS SUMMARY: Standards for Quality Assurance: Sign Language Content

		MINIMUM STANDARD	SILVER STANDARD	GOLD STANDARD
Reviewers	The review team has a mixture of deaf and hearing reviewers who are fluent in the targeted sign language.			
	The reviewers are all deaf and fluent in the targeted sign language.			
Viewability for Sign Language Storybooks Quality Assurance Evaluation	All categories have at least 4 stars.			
	All categories have 5 stars.			

Using a Book Creation Platform

CHAPTER

8



Credit: RIT/NTID,
Fiji Team

The number of book creation platforms that accommodate sign languages is increasing (see Learning from Prior Storybook Works section). Storybooks available for deaf children in their sign language are crucial to their language and literacy development. There are book creation platforms available to create signed storybooks for both online use and offline access.

Such book creation platforms require the creation of digital files in advance in order to upload them to the platform to create a storybook. Digital files include video-textual data (for signed language), textual data (for written language), and image data (for illustrations). To produce high quality books,

images should be at least 400p x 400p and video should be 720p x 1280p. Video can be saved as .mov, .mp4, .flv or another compatible video file format.

In addition, storybooks require metadata tagging. This includes, but is not limited to, the title, author(s), illustrator(s), year of publication, Creative Commons license(s), short story description, grade level, funding organization (if any), and/or story keywords. Be sure to include the sign language translator or storyteller's name in the metadata, for attribution of their role in creating this story in their sign language(s). Once all the information and files are ready to create a storybook, the following platforms can be used.

World Around You (WAY)

[Deaf World Around You \(WAY\)](#) has a video providing instructions on building storybook content [here](#). First, create a WAY account, which then allows contributions as an author or a translator. Use the Create tab to build a storybook. The Chrome browser is recommended for easier access. WAY supports all aspect ratios and resolutions. Although a 4:3 aspect ratio will display best for screens of all sizes, widescreen images such as 16:9 will utilize space the best. For glossary images, WAY supports all aspect ratios and resolutions but widescreen images will be reduced; adherence to a square aspect ratio is recommended. Aspect ratios of 1:1 and 4:3 work best. For quality purposes, glossary images should be a minimum of least 200p x 200p.







Bloom

[Bloom](#) has a library of instructional [videos](#) on building storybook content. Download the stories and share them in settings without Internet access using the [Bloom Reader app](#). To find the download button, click on the link that starts with “#vimeo.com” followed by several numbers (this is currently in the lower right corner). To create a sign language storybook or to add sign language videos to one of their existing storybooks, set up an account on Bloom.



STANDARDS SUMMARY: Standards for Book Creation Platform Images and Videos

		MINIMUM STANDARD	SILVER STANDARD	GOLD STANDARD
Images	Storybook images should be at least 400p x 400p			
	Glossary images should be at least 200p x 200p			
Videos	Video should be at least 720p resolution			
	Video can be saved as .mov, .mp4, .flv or another compatible video cfile format			

Accessibility Guidance

CHAPTER

9



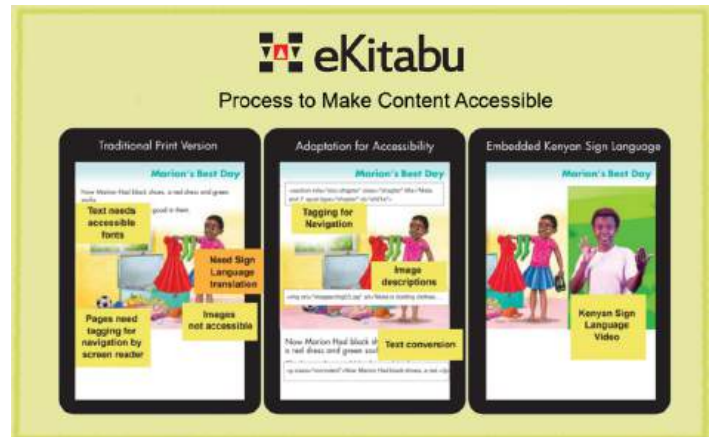
Credit: Esaie
Kamaté/SIL Mali.

While sign language documents may contain images and audio or video elements, the entirety of the file itself must conform to accessibility standards. Texts are considered “accessible” when they meet a given standard that exists for making content presentable and understandable to users who may require assistive technologies or other optimizations. Within the context of EPUB and PDF formats, accessibility can be checked by two main tools: **[Ace \(by the DAISY Consortium\)](#)** and **[Adobe Acrobat Pro](#)**. Both of these tools are used to check for elements that may have been omitted during the file creation process. Content developers must use either of these to check files before publication.

EPUB files are considered accessible when they meet the [EPUB Accessibility](#) guidelines. Much of what is covered in these guidelines relates to the [Web Content Accessibility Guidelines](#) (WCAG) 2.0 standard. The WCAG standard, incidentally, is what is used for PDF accessibility assessment.

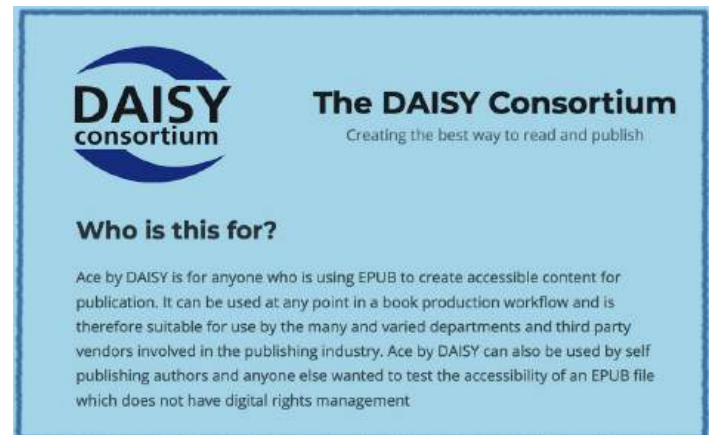
Creating an Accessible EPUB

Through ACR GCD funding, eKitabu created an Accessible EPUB Toolkit. This Toolkit helps create an accessible EPUB with alt text/ image descriptions, accessible navigation, text highlighting, and optional sign language videos. To date, the toolkit has been adapted for Kenya, Malawi, and Rwanda and is available [at this link](#). The RIT/NTID team contributed to this toolkit by providing input.



Using Ace by DAISY to Check EPUBs

When exporting a storybook as an EPUB, use of [Ace by DAISY](#), a free, open source tool designed to check the accessibility of EPUB files, is strongly recommended. Ace by DAISY runs accessibility tests on EPUB storybook content (metadata, texts, images, document outlines) and checks whether it meets the EPUB Accessibility Specification for users of assistive technologies. Ace, is available in command-line or desktop format at [this link](#).

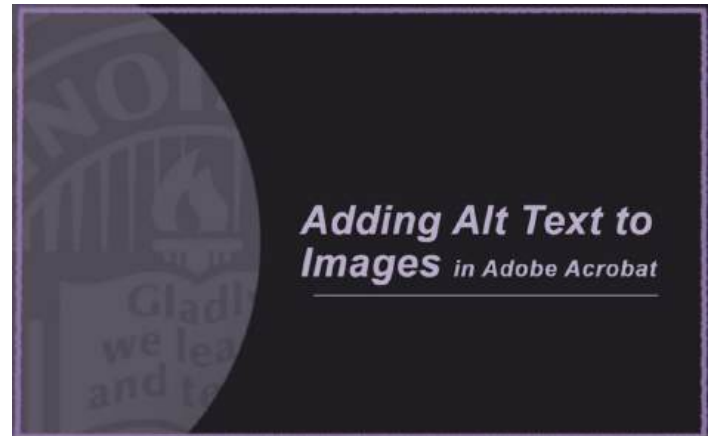


After testing, Ace by DAISY produces an HTML report with a focus on violations, metadata, document outlines (i.e., document structure), and images. Content creators should correct any violations to ensure the accessibility of produced EPUBs. Ace by DAISY will also check images to determine if they have alternative text (called alt text), a description of the images that is used by screen readers to make images accessible.

[Adobe Acrobat Pro](#) is recommended for adding alt text to images. Texts are considered accessible when

they meet the ACE by DAISY EPUB Accessibility Specification, which means the texts are presentable and understandable by users of assistive technologies.

The Ace command-line tool is an advanced option that can be integrated into a content creation organization's workflow as part of a "pre-flight" checking routine. Alternatively, the desktop app is available and easy to use on files one at a time. Both tools report any accessibility issues, matrixed by various standards and best practices.



Using Adobe Acrobat Pro to Check PDFs




DeafBlind readers must have accessibility to the information in the storybook, including alt text. Alt texts in a PDF allows them to see the details in each image.

Adobe Acrobat Pro is a commercial tool that is available only as a purchased application. Within Acrobat Pro, the Make Accessible suite of routines guide the user through the steps to make an accessible document. Acrobat Pro can be run on a single PDF, multiple files or an entire folder. Once an accessible document is created (or an existing PDF is chosen), Acrobat Pro's Accessibility Check feature will detect any issues as they relate to WCAG standards and best practices. If any accessibility issues are detected, Acrobat Pro can be used to rectify these through the Fix Context menu alongside any violation.

While both Ace by DAISY and Adobe Acrobat Pro are excellent choices for images (such as static illustrations or photographs) as well as accompanying text, they do not specifically address accessibility issues present within video or audio content. Video and audio content are treated as "media overlay" elements, and thus are only given a surface-level check to see if metadata and descriptors surround these.

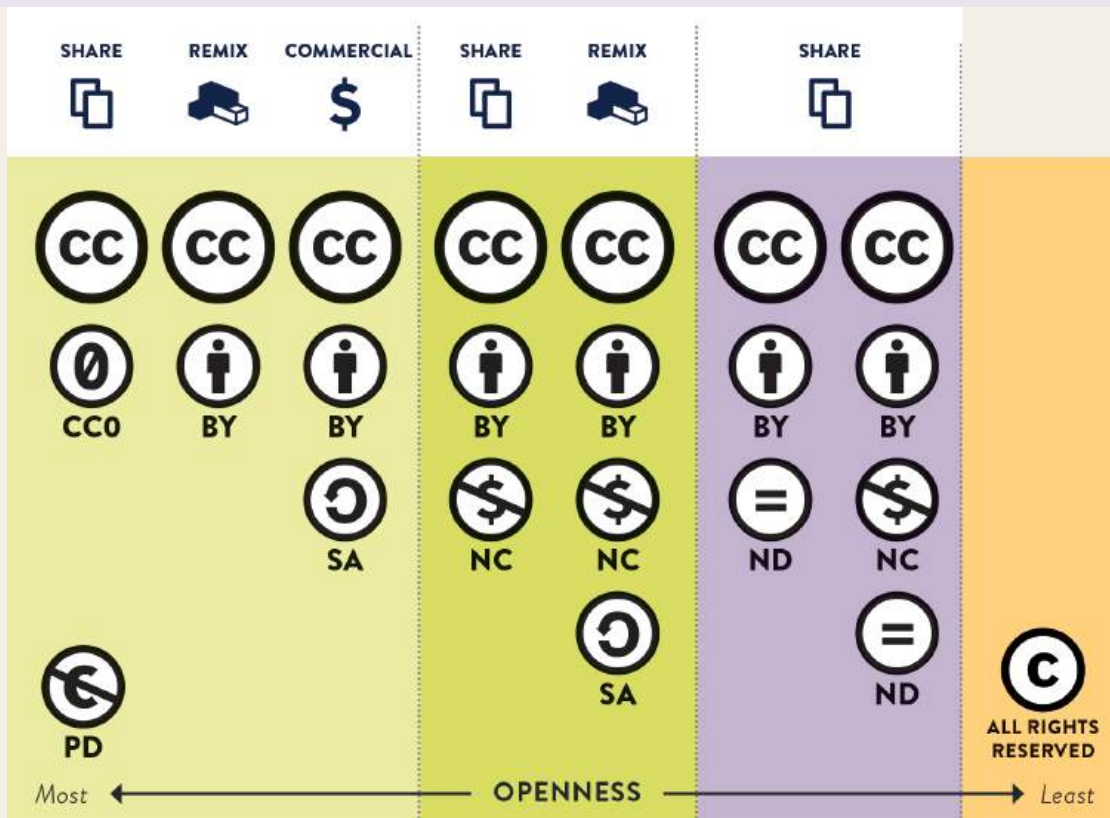
After checking the PDF and EPUB files for accessibility with ACE by DAISY and Adobe Acrobat Pro, and making any needed corrections, the files are now accessible for publication.

STANDARDS SUMMARY: Standards for EPUB and PDF Accessibility

		MINIMUM STANDARD	SILVER STANDARD	GOLD STANDARD
EPUBs	No WCAG 2.0 level AA issues in EPUBs			
	No WCAG 2.0 level A and level AA and best practices issues in EPUBs			
PDF	No issues in PDFs for accessibility			

Licensing

CHAPTER
10



Credit: Shaddim, Creative Commons License Spectrum

Copyright is a type of intellectual property used to protect the authorship or creation of a storybook. Different types of licenses are available when creating or seeking to use other books. Some materials are freely available, but many quality works appropriate for early reading are copyrighted. There are intellectual property licenses that permit free use of or copying, distributing, editing, remixing, selling, and/or building on existing materials.

In most countries, once a creative expression (e.g. a story, a photograph, a film) has been put into a fixed form (e.g. a written or printed story, a picture or movie published on the internet) its copyright is

owned by its creator. A license for adaptation is then required for others to create new signed or textual languages based on the original content. Rather than having multiple individuals contact the creator for licenses, creators can select a **Creative Commons** license for their work.

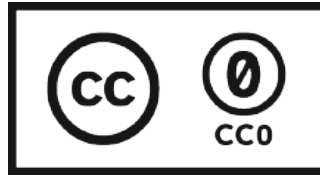
Creative Commons is the most well-known licensing framework. It provides the legal framework for the copyright holder to specify the permitted use of the materials, including storybooks. There are different licenses available.

Creative Commons Attribution License

provides a standardized way to grant copyright permissions to storybooks or to understand the permission(s) copyright holders have given for others to use their work, potentially facilitating free access to all kinds of materials (Commonwealth of Learning, 2011).



Copyright ©: No one else may add to, change, or modify the storybook unless they receive written permission (a license) from the creator to do so, or unless the work is formally placed in the public domain. This means it is unlawful to edit, copy, use, or sell the storybook without obtaining permission from the copyright owner first. If the copyright owner grants permission, it is permissible to proceed with the action (e.g., adding signed videos, editing, copying, using, selling) they agreed to.



Public Domain (non-C): If the creator formally places the storybook in the public domain, the creator gives up all rights to it and permission to use their work is not required. This means users are free to make changes to a book by another author, such as adding deaf characters, adding signed or textual languages, changing settings, etc. New books created can also be widely shared.



Creative Commons (CC): This means content creators can reuse the story, modify its structure, share it with others, monetize it through sales, or publish it on online platforms or in print. When choosing a license for a book, or seeking to modify a book created by someone else, be sure to check the specific meaning and requirements of each type of CC license, which will be explained next.



CC - Attribution (BY): This means adjustments can be made to the story such as adding new signed or textual languages, changing the reading level, adding characters, or editing sentences. This

also means selling or publishing the revised story is allowed as long as credit is given to the author(s).



CC - Non-commercial (NC): This means making modifications to the story with the intention of selling the book is not permitted. However, edits can be made to the story solely for your own purposes and ownership.



CC - No Derivative Works (ND): This means the story can be used freely on an online platform or copies can be made of it. However, the story cannot be edited or modified in any way.




CC - Share Alike (SA): This allows the reuse, remix, and modification of works, but any modified works must adhere to the same terms and conditions as the original work.

CC - Commercial: This means there are no restrictions on selling a new story created by a user or selling a modified version of the existing story created by a user.

Through maximized use of Creative Commons in these digital libraries, combined with a contextualized solution for online and offline retrieval, creators can significantly increase access to freely available reading materials for children who are deaf. By using Creative Commons licenses when creating books, or leveraging Creative Commons books by adding them to a digital library, deaf children can have access to more freely available signed storybooks for online and offline reading, viewing, and enjoyment.

STANDARDS SUMMARY: Standards for Licensing

	MINIMUM STANDARD	SILVER STANDARD	GOLD STANDARD
Storybooks with CC 4.0 BY license			

Technical Quality Assurance

CHAPTER

11



Credit: RIT/NTID
& College of St.
Benilde, Philippines.

Before publishing storybooks, employing technical quality assurance to ensure the storybooks are accessible, licensed, and usable on different devices (e.g. desktop computers, tablets, and smartphones) and in different settings (including educational settings) is strongly recommended. Technical errors in storybooks can prevent widespread use. Appropriate punctuation, capitalization, font type and size, letter and word spacing, content review, leveling, metadata, and tagging are all necessary to ensure high-quality content is usable via digital platforms hosted by governments and other organizations to support quality learning. These are covered in the content section, the quality assurance sections, the licensing section, and the accessibility section.

Branding and Marking

CHAPTER

12



Credit: Patrik Michalicka via Unsplash.com

Branding and marking are used to let readers know which organization(s) or agency(ies) created and/or funded the production of content, such as signed storybooks. The most common type of brand mark is a logo. A logo is a symbol usually made up of text and an image that provides a visual representation of an organization. Add your organization's logo and information to books you create and ensure appropriate attributions are included for story authors, illustrators, translators, and story tellers/signers. For example, this document has the following logos.






If working with a partner(s) and/or have received financial support from a donor organization for the production of books, check with the donor/partner on any marking and branding requirements they have and include their logo(s) and/or any information they require. If the books are validated or approved for inclusion in the educational curriculum by a government agency (e.g., Ministry of Education), check with the agency for their branding and marking requirements.

An example of marking and branding in a sign language storybook showing the logos of the organizations and agencies that created and funded the book.

This product is made possible through the support of the All Children Reading: A Grand Challenge for Development (ACR GCD) Founding Partners (the United States Agency for International Development [USAID], World Vision, and the Australian Government) in collaboration with the Global Book Alliance. It was prepared by World Around You and WAY international partners and does not necessarily reflect the views of the ACR GCD Founding Partners or the Global Book Alliance. Any adaptation or translation of this work should not be considered an official ACR GCD translation, and ACR GCD shall not be liable for any content or errors in this translation.



STANDARDS SUMMARY: Standards for Marking and Branding

		MINIMUM STANDARD	SILVER STANDARD	GOLD STANDARD
Marking & Branding	Add your organization’s branding on the book			
	Books meet the marking and branding requirements of the project partner and/or funding donor			
	Books validated or approved for inclusion in the educational curriculum by a government agency (e.g., Ministry of Education) meet the marking and branding requirements of the agency			

Additional Formats

On Demand Video Training

These standards are complemented by a series of YouTube training videos for each lesson and are presented in sign language and/or with closed captions.

Video Trainer Bios



Patrick Graham

Patrick Graham, Ph.D. is an associate professor and the department chair in the Master of Science in Secondary Education program at RIT. His research interests include early childhood education, language and literacy development, equity in education, disability studies, multicultural education, and culturally sustaining pedagogy.



Stephen Jacobs

Stephen Jacobs is a professor in the School of Interactive Games and Media at RIT, where he teaches courses for the master's and bachelor of science degrees in Game Design and Development, currently ranked number four and two in the country respectively. He is co-principal investigator of the WAY platform, an international multilingual sign language book platform (deafworldaroundyou.org), created through the ACR GCD's Sign on for Literacy prize.



Chris Kurz

Christopher Kurz, Ph.D. is a professor in the Master of Science in Secondary Education program at RIT. He is the director of the Deaf Mathematics and Science Language and Learning Lab. He is currently a leading principal investigator of the WAY platform, an international multilingual sign language book platform (deafworldaroundyou.org/), created through the ACR GCD's Sign on for Literacy prize.

STANDARDS FOR SIGN LANGUAGE STORYBOOKS



Kim Kurz

Kim Kurz, Ph.D. is a professor in the Department of American Sign Language and Interpreting Education at RIT. She is also the director of Sign Language Laboratory at the NTID where she looks at the cognitive benefits of learning sign languages and linguistic development in students are sign language learners.



Sonny Lacey

As a champion of user-driven design and clear experiences, Sonny is an education technology consultant in the U.S. with field projects in Africa and Central America. He has consulted on various ACR GCD projects, including the Tracking and Tracing Books prize competition (Malawi), No Lost Generation Tech Summit prize to support the creation of 100 audible, leveled, accessible STEM (science, technology, engineering and math) themed Arabic language storybooks, and the EVOKE educational social game platform in South Africa. He also has conducted projects around textbook supply chain transparency with BlueTree Group and consults for Worldreader.



Truc Nguyen

Born and raised in Dong Nai, Vietnam, Truc Nguyen recently graduated with a master's degree in Secondary Education for Students Who Are Deaf and Hard-of-Hearing at RIT/NTID. While at RIT/NTID, she had served in numerous capacities, such as a teaching assistant for the American Sign Language for New Signers program, summer transition education program assistant, and peer advisor for freshman seminars. She has also worked with the WAY project for the past year, managing multimedia tasks and coordinating sign language translators. Before she studied at RIT/NTID, she taught Vietnamese to deaf students in grades five and six. She has an associate degree in deaf education from Dong Nai University. She is a co-founder of Tay Noi Mat Nghe, an advocacy organization for the deaf in Vietnam.



Michelle Oetman

Michelle Oetman is a Senior Program Manager for ACR GCD, an initiative that advances EdTech innovation and research to improve reading outcomes for marginalized children in low resource contexts. During her time at ACR GCD, she has managed communications, events, integration, and brand strategy on behalf of the ACR GCD founding partners: USAID, World Vision, and the Australian Government.



Erin Anderson Williams

As a Program Manager for ACR GCD, Erin Anderson Williams manages grants and prize competitions focused on the development of teaching and learning materials in underserved languages to support local language instruction and improve reading outcomes.



Michael Vea

Michael Vea is a college faculty member in the School of Deaf Education and Applied Studies at De La Salle-College of Saint Benilde in Manila, Philippines. He has taught courses in English, World Literature and Deaf Studies at DLS-CSB since 2004. He earned his Master of Arts in Language and Literature with a major in Literature at De La Salle University. He served as secretary-general of Phil-Sports Federation of the Deaf from 2007 to 2011, and as its president from 2011 to 2016.



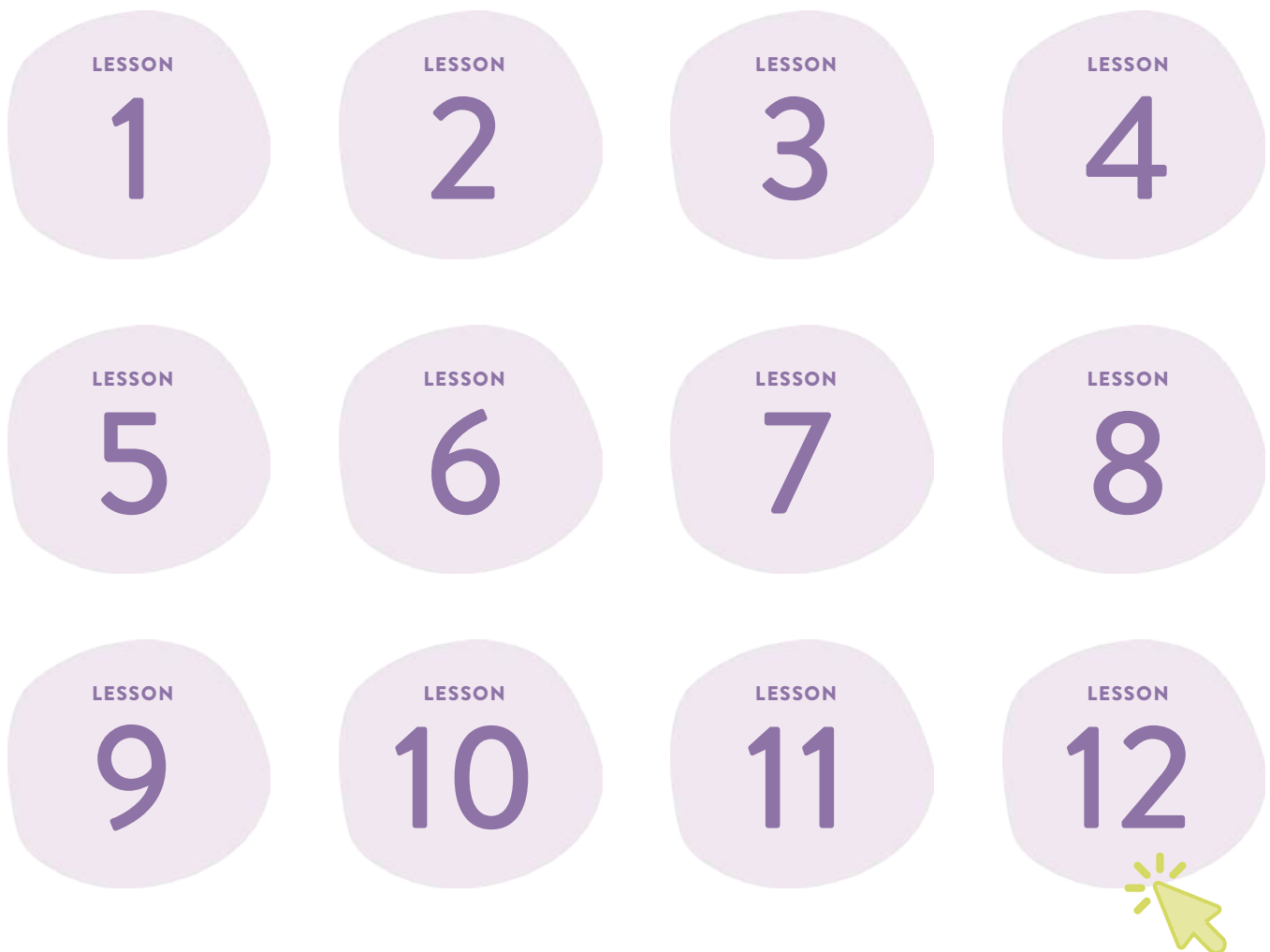
Laura Lesmana Wijaya

Laura Lesmana Wijaya, M.A. is deaf and was born into a deaf family. She is fluent in Bahasa Isyarat Indonesia/Indonesian Sign Language and Bahasa Indonesia. In 2020 she became the first deaf Indonesian to graduate with a master's degree in Sign Linguistics from the Chinese University of Hong Kong. She is currently the head of the Sign Language Center in Indonesia under the Indonesian Association for the Welfare of the Deaf. She also works as a sign language researcher in the Sign Language Research Laboratory under the Faculty of Humanities in University of Indonesia.

Signed Reference Guide

These standards are complemented by a Signed Reference Guide available in two formats:

Signed Reference Guide (on WAY Platform) - EPUB presented in International Sign with English captions. This EPUB is open source and can be translated to other sign or written languages. To add a different sign or written language, log on the authoring interface of the WAY platform and add the video written texts, and then publish them.



Signed Reference Guide (on YouTube) - presented in International Sign with English captions. To translate the videos into another language, create YouTube videos using these images and then add languages.

Definitions

WORD	DEFINITION
Animated image	A visual representation that shows movement of something.
Closed captions	Written text on a video that can be turned on and off by the viewer.
Eye gaze	Visual attention as a linguistic feature. Eye gaze is part of the sign language.
Image	A visual representation of something (e.g., a picture, painting, photograph, drawing, illustration).
Independent language mode	Written text is shown outside the video.
Metadata	Data about data content.
Language Deprivation	Language deprivation is an anomaly in hearing children and only emerges in severe cases of neglect in which the child experiences prolonged periods of isolation from other people and languages. Conversely, language deprivation is extremely common in the deaf population although deaf children are around their families at home and peers at school (Hecht, 2020). Although signed language is always fully accessible to deaf children and can prevent language deprivation, most deaf children do not have access to adults or peers who learn and use signed language. Consequently, not having adequate language access during the critical period of development impacts language processing (Mayberry & Kluender, 2017), executive functioning (Goodwin et al., 2022; Hall, 2020; Morgan et al., 2021), and literacy acquisition (Holcomb et al., 2023). Language deprivation is avoidable and preventable with a proper system of support in place at home and in school.
Open captions	Written text on a video that is always in view and cannot be turned off.
Print language	A language that is written (as on paper, on screen, and on any surface).
Sign language	A natural language developed and used by deaf people in Deaf communities that is unique to that region or country. While there are over 300 sign languages, only 76 countries have achieved sign language legislation as of December 14, 2022 (World Federation of the Deaf, 2022, Retrieved from wfdeaf.org/news/the-legal-recognition-of-national-sign-languages/).
Signed text	Information that is delivered in sign language (synonym: signed video).
Signed word	Word/concept that is formed with the hand(s), sometimes in combination with a nonmanual component: handshape, location and movement and has a meaning.
Signer	An individual of diverse gender, racial, ethnic, disability, cultural, linguistic, geographical and socioeconomic background who uses sign language to communicate.
Storysigning	Retelling a written story using sign language translation.
Storytelling	Telling an original story in sign language.
Written text	Information that is delivered in print language (print/written are used interchangeably).

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Appendix A : Sign Language Dictionaries

The number of online sign language dictionaries has flourished in the past few decades with the advances of digital video technology. However, it may be more appropriate to develop them in a dictionary creation tool, such as [SooSL](#) developed by SIL International, rather than in a platform designed for books. This is NOT an exhaustive list of sign-text e-dictionaries.

ARGENTINA

[Manos que hablan](#)

AUSTRALIA

[Auslan SignBank](#)

BRAZIL

[Hand Talk](#)

CAMBODIA

[Words and Pictures](#)

GHANA

[Ghanaian Sign Language App](#)

JAPAN

[Online JSL lessons and dictionary](#)

KENYA

[KSL Dictionary](#)

[African Sign Language Dictionary app](#)

[Deaf eLimu Banking](#)

MALAWI

[Malawian Sign Language Early Grade Vocabulary](#)

NEPAL

[Nepali Sign Language Dictionary](#)

NEW ZEALAND

[Online New Zealand Sign Language Dictionary](#)

[NZSL Dictionary](#)

NICARAGUA

[Signs and Smiles App \(iOS | Android\)](#)

PAKISTAN

[Pakistan Sign Language](#)

PHILIPPINES

[Filipino Sign Language \(APP | APP 2\)](#)

SOUTH AFRICA

[FingerTalk SASL Dictionary](#)

[SA Sign Language Dictionary](#)

UNITED KINGDOM

[Sign BSL](#)

[Online British Sign Language Dictionary](#)

[Spreadthesign](#)

This site has gathered signs from different sign languages around the world. It is administered by the non-profit association European Sign Language Centre and the project is an ongoing process. At publishing, the dictionary has collected and documented over 500,000 signs.