

A Practical Guide for Using EPUB in K–12 Teaching & Learning

By the National AEM Center, DAISY Consortium, and Bookshare

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Executive Summary

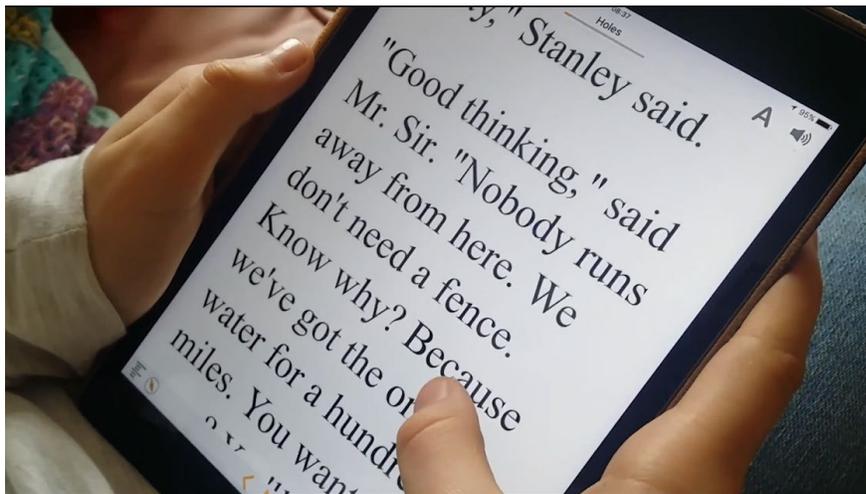
Revolutionary changes in educational materials are happening now, and it is essential that we understand the positive impact these changes can have on our school systems. Twenty-five years ago, PDF hit the scene and created a file format to make it technically possible to share files that could be printed exactly the same without fear of any modification. Today the digital publishing industry is designing for students who use devices of all shapes and sizes, which requires flexibility in the presentation of educational materials. This is the exact opposite of the strict, rigid PDF format, which is perfect for printing. The flexible EPUB format has been embraced by the digital publishing industry and it offers outstanding advantages, especially accessibility for students who use assistive technology (AT). EPUB has been fully embraced by higher education publishers, and K–12 publishers are now starting to modify their publishing workflows to create EPUB content. However, as educators, we need to be aware of what is technically required in our schools and procurement policies to take advantage of these breakthroughs and what all teachers need to know to support the modern digital reading experience.

We recommend this guide to be required reading for administrators, IT professionals, and teachers. It describes the broad adoption of the open, royalty-free EPUB format in the publishing industry and what RFPs should specify for maximum effectiveness. Users of this guide will learn how apps (reading systems) can personalize the reading experience, which benefits everybody. It also details how students with reading difficulties can benefit from the rich range of accessibility features built into the EPUB format and into apps. Teachers and curriculum development professionals will learn how to use common word processing software to create their own fully accessible materials as EPUBs.

Overview

This guide addresses the challenge of inaccessible digital learning resources by providing K–12 education stakeholders with actionable information about EPUB, a digital file format. EPUB is a widely adopted format for many digital books and is specifically designed to display text, audio, images and, in some cases, video in a manner usable by all learners, especially those with sensory, physical and learning disabilities. For these students, the ability to personalize the format of learning materials is essential; and for all students, EPUB simply provides more options: it can be more accessible, in more ways, than any other format.

The primary audience is district-level decision makers. The selection of curriculum materials in most elementary and secondary schools occurs at the district level. However, most classroom teachers augment district choices with their own content selections, and those teachers will also find the perspective and practices detailed in this guide useful. Family members and caregivers seeking to supplement school-provided resources for students with learning needs will also find this information helpful. Finally, and perhaps most importantly, students who want or need to direct their own learning will find some flexible alternatives to the materials they're traditionally provided.



Introduction

As most families and schools can attest, the expansion of EdTech resources over time has been significant. Some of this growth has been anticipated, while some was unexpected, but in either case digital curriculum resources — mobile devices, virtual conferencing, curriculum/learning management systems, levelled ebook readers, and other technologies that were once ancillary — have become commonplace in the wide-ranging learning environments that exist today.

Reaching Every Student

As schools expand the use of digital curriculum resources, ensuring that these are usable by each student is not only important, but legally required. Learning resources must be appropriate for all students, including those with disabilities. Addressing the needs of students with sensory, physical, learning, and cognitive disabilities is both a civil right and an educational mandate. The U.S. Department of Education has stated that timely access to appropriate and accessible materials is an inherent component of the obligation of public education agencies to ensure a free appropriate public education

(FAPE) to children with disabilities so that they can participate in the general education curriculum as specified in their Individualized Educational Programs (71 Fed. Reg. 46618) or their Section 504 Plans. This obligation was reiterated by the U.S. Department of Justice, Civil Rights Division in a June, 2010 [Joint “Dear Colleague” letter](#) referencing Electronic Book Readers.

Acknowledging the challenge presented by inaccessible digital curriculum materials, the U.S. Department of Education’s Office for Civil Rights (OCR) is [intending to launch](#) an extended series of “compliance reviews” in a number of education-related institutions, including K–12 schools. Simultaneously, OCR released a series of informational videos detailing the need for schools to take an informed and accurate role in acquiring EdTech, learning materials and tools that are truly inclusive. OCR reported that its National Digital Accessibility Team has resolved more than 1,000 cases since its creation in 2019. Compellingly, the [UsableNet 2021 Year End Report](#) documented nearly 4,000 lawsuits in 2021; nearly 10 per day. While the majority of the complaints targeted ecommerce websites, educational settings were in no way immune to civil rights litigation.

Consequently, acquiring or creating digital resources that are accessible from the outset becomes a key consideration for district decision makers. Accessibility features designed for learners with disabilities — magnification; text-to-speech; color customization; etc. - offer enhanced flexibility for linguistically diverse students, and simply provide more alternatives for every learner.

Why EPUB?

In the best circumstance, digital learning materials would be easily transformable from one type of media to another, to meet student needs or preferences: text rendered in audio for learners with low vision; audio to text for learners with limited hearing; text to speech for learners with reading disabilities; images with text descriptions; videos with captions and description; textbooks in braille, etc. While not all of these transformations are quick to achieve, many may be, if the core material is available in the EPUB format. EPUB is an open format that is extensively used for digital publishing around the world. Many of the tools for creating and reading EPUB are free and in some cases even available as built-in options on many devices used in schools.

Functional capabilities

EPUBs built to conform to the most recent [accessibility guidelines](#) can be transformed from one media type to another and displayed to students in their preferred format. Most importantly, this “customization” can be 1) done relatively automatically and 2) from a

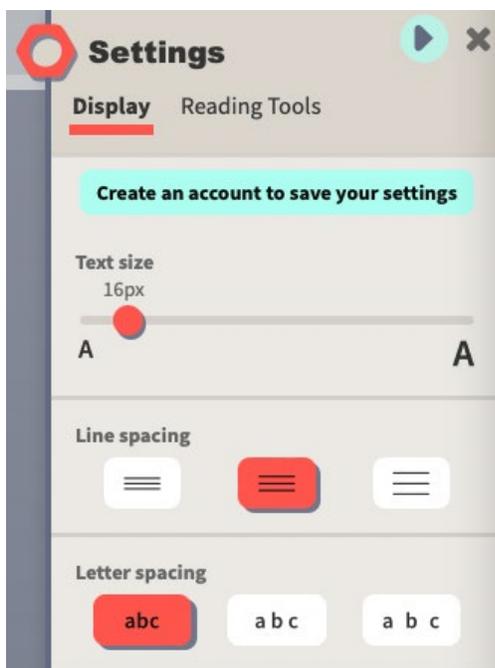
single EPUB product, which means that all students will have access to the same content at the same time.

Reading

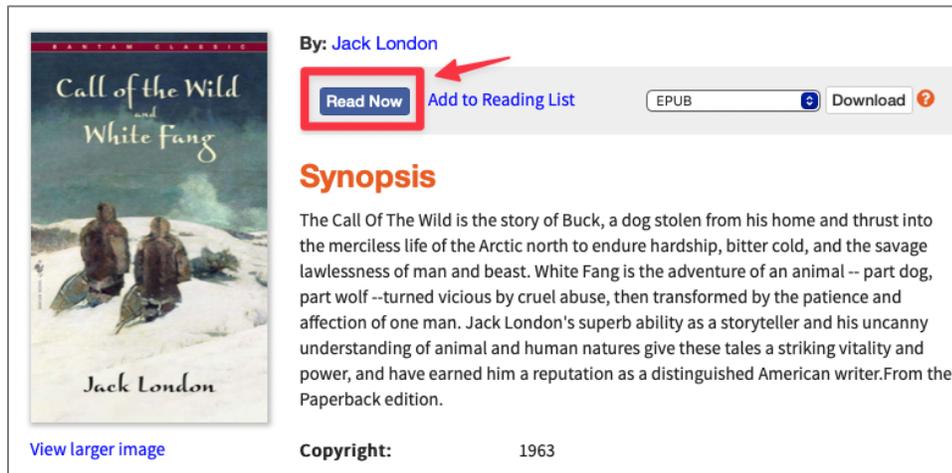
As referenced in the AEM Center’s web page, “[Personalizing the Reading Experience](#),” the following customizations for EPUB may offer features designed to support reading:

- Visual adjustments — text sizes, font choice, custom color themes, adjustable margins, which are especially important to low-vision and dyslexic students.
- Read aloud — spoken text with or without visual highlighting (by word, chunk, sentence, paragraph, page, etc.), which can be useful to many students whether or not they identify as having a reading disability.

To experience the flexibility EPUB offers, explore the title, “[All About Coyotes](#),” available on [Clusive](#), an adaptable online learning environment developed at CAST with funding from the Office of Special Education Programs at the U.S. Department of Education. Select the “Play” button to hear the content read aloud, or open the Settings pane to adjust the display of the content and customize the read aloud feature. Clusive includes options for text size, line and letter spacing, fonts, color combinations and more. Under Reading Tools, you will find options for selecting different voices (based on the operating system) and adjusting the reading speed. You can learn more about the design of Clusive as you read the title, “[Clues to Clusive](#),” available in the Clusive library.



Bookshare users can experience options available within the EPUB format by selecting the edition of Jack London’s “The Call of the Wild.” Select “Read Now” to use Bookshare’s Web Reader tool to immediately begin reading the book.



By: [Jack London](#)

[Read Now](#) [Add to Reading List](#) EPUB [Download](#) ?

Synopsis

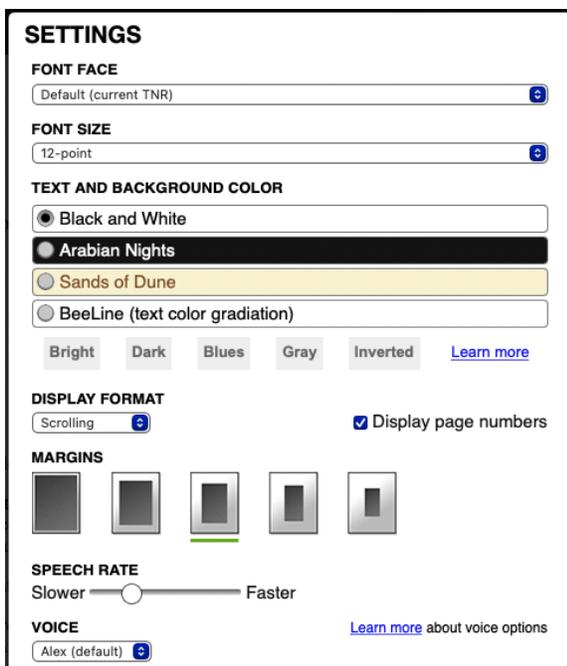
The Call Of The Wild is the story of Buck, a dog stolen from his home and thrust into the merciless life of the Arctic north to endure hardship, bitter cold, and the savage lawlessness of man and beast. White Fang is the adventure of an animal -- part dog, part wolf --turned vicious by cruel abuse, then transformed by the patience and affection of one man. Jack London's superb ability as a storyteller and his uncanny understanding of animal and human natures give these tales a striking vitality and power, and have earned him a reputation as a distinguished American writer. From the Paperback edition.

Copyright: 1963

[View larger image](#)

In the Web Reader tool, select the “Play” button to hear the content read aloud. Select the “Settings” button to customize the audio experience and use other features to aid members with partial sight impairment or dyslexia, such as changes in colors, font, text color gradation, and use of page numbers.

Bookshare members can also use the menu of format choices to download the book as an EPUB or a choice of formats made available through Bookshare’s conversion engine, including Braille Ready Files (BRF), DAISY format, HTML, and Word.



SETTINGS

FONT FACE
Default (current TNR)

FONT SIZE
12-point

TEXT AND BACKGROUND COLOR

- Black and White
- Arabian Nights
- Sands of Dune
- BeeLine (text color gradation)

Bright Dark Blues Gray Inverted [Learn more](#)

DISPLAY FORMAT
Scrolling Display page numbers

MARGINS

SPEECH RATE
Slower Faster

VOICE
Alex (default) [Learn more](#) about voice options

Multimedia

Since EPUB products can incorporate image, audio, video resources, and interactive content, accessible versions offer additional supports. Details are provided in the DIAGRAM Center’s [“Top Ten Tips for Creating Accessible EPUB3 Files.”](#) Supports include:

- Images — text equivalents for simple images and in-depth descriptions for more complex graphics
- Video/Audio — captions, descriptions, transcripts

Braille

With a connected refreshable braille display, blind readers can enjoy highly accessible and usable content. The logical structure and attention to detail possible with EPUB products makes extracting the necessary information to create well-formed braille both more predictable and more automatic.

Mathematics

EPUB can contain MathML, the preferred format for creating transformable equations and basic math, and this helps ensure that students with visual, learning, and/or attentional challenges can equitably access rich content.

Content/Learning Management System Interaction

Nearly every K–12 school uses some type of membership-based system for curating, cataloguing and delivering digital learning resources for students. The EPUB specification offers protocols for facilitating the use of EPUB products within these CMS/LMS systems. These protocols can support single sign-on, progress, achievement tracking, and appropriate protection of student data privacy.

Case studies

The hypothetical case descriptions below illustrate the way that EPUB-based resources can support both teachers and students.

The Classroom

Kesha Jeffords teaches fourth grade at Oak Hill Elementary, a class of 27 students as diverse as the city itself. Half of her students are eligible for free or reduced-cost lunch, while the remaining students reflect the influx of more economically advantaged families

into the predominantly low-income neighborhood served by the school. Parents' investment in their children's education is as varied as the community itself, but family involvement with Oak Hill has increased significantly due to the COVID pandemic and the shared experience of a year of remote learning. Kesha's students are back in the classroom in person, but the digital tools and network resources that kept them connected while everyone was remote continue to provide essential support, both for those physically in class and those temporarily quarantined at home.

The District

During the twelve-month period of full remote learning, Kesha's district used available funds to upgrade the network, provide tablets to teachers and students, train teachers on strategies related to remote instruction, and acquire digital curriculum materials that were specifically designed with learners in mind, especially those students with sensory, physical, learning, and cognitive disabilities.

For instructional materials, the district determined that the best option would be to acquire digital learning resources that offered customizable learning supports - audio, magnification, embedded captioned media, tactile representations, and other functions - that would enable each student to interact with the same content in unique ways. This approach would ensure that the needs of students receiving services under special education or civil rights laws would be met and that students without identified learning needs would simply have more learning options available to them. The district decided to acquire digital materials in the EPUB format wherever available.

In addition, the district created a school-home communication and learning team to monitor student involvement in day-to-day instruction, identify parents' concerns, and establish procedures that the district could put in place to support students and to address parents' needs. The team was also charged with reviewing the experiences of other comparable school settings with those that have more extended involvement in virtual learning (see [NCVirtual](#); [Florida Virtual School](#)), and to compile some relevant research findings to support their recommendations (see [Digital Promise](#) and [Aurora Institute](#)). The district's policies and the practices that evolved from them were instrumental in creating support for school personnel, students, and families during the pandemic, support that continued as students returned to in-person learning.

The Students

Kesha's fourth graders include Rolly, a student with cerebral palsy and learning and attentional challenges; Magda, who has limited visual acuity; Carlos and Santine who are second-language learners; and 23 other students, each with individual learning

preferences and varied achievement levels. In the core academic area of reading, Kesha is grateful that the levelled readers she uses come in both paper and digital versions and that the latter are available online for both in-school and home use. While a number of students use the print versions, many choose the digital EPUB-based option for its built-in accessibility supports, such as:

- For students like Rolly who are unable to physically hold or turn the pages of a print book, the EPUB version allows them to independently progress through the texts using a special keyboard, and their digital books can be set for sentence-by-sentence visual highlighting with custom pacing to support focusing. Rolly can also activate text-to-speech support to hear unfamiliar words aloud.
- Magda’s version of the same digital book combines a self-paced read aloud function with simultaneous braille output to a refreshable braille device. While Magda still needs the assistance of a teacher of students with visual impairments (also known as a teacher of the visually impaired or TVI), the fact that braille can be generated directly from the EPUB text is an enormous time saver.
- Carlos and Santine are both native Spanish speakers, and while they are becoming more fluent in English, they continue to benefit from the ability of their digital books to translate and pronounce unfamiliar words. This functionality allows them to maintain the flow of the text and not be distracted by unfamiliar terms. In digital books with text in both languages, they enjoy using the built-in read aloud feature that magically switches between English and Spanish voices.
- A number of other fourth graders in Kesha’s class prefer the digital EPUB books to the print versions. Kesha has determined that it makes sense to allow any student to use the built-in EPUB supports to enhance their comprehension.

Kesha Jefford’s practice is to provide her students — those with significant learning needs and those who simply have different learning preferences — with flexible and inclusive learning resources. EPUB-based digital books and teacher-produced resources provide an array of options that allow students with sensory, learning, and attentional disabilities, as well as students learning a second language and others to work with the same high-quality curricular materials at the same time. This functionality built into the books themselves eliminates the need for Kesha to retrofit learning resources so that she can concentrate on the process of teaching and learning.

What will your district, school or classroom need to address in order to use EPUB-based curriculum resources in day-to-day learning?

The EPUB Experience for Learners

There are a number of collections or online repositories where learners can search for EPUB titles that match their interests:

- [Bookshare](#): Members with qualifying print disabilities can access a collection of over one million titles and “read their way” with EPUB being one of the formats available for download or online reading. Bookshare’s conversion engine also ingests EPUBs submitted by publisher partners to make them available in a variety of other formats.
- [Standard Ebooks](#) takes public domain ebooks from sources like Project Gutenberg and formats and typesets them with a modern style manual, fully proofreads and corrects them, and then builds them to create a new edition that takes advantage of the latest ereader and browser technologies. Titles are available in different versions of EPUB, optimized for compatibility with most readers or in an advanced format that includes the latest technologies not yet supported by all readers.
- [OER Commons](#) is a public library of Open Educational Resources (OER). OER catalogued in OER Commons range from individual objects (modules, lessons, readings) to full courses. The platform on which OER Commons runs also includes an authoring component known as Open Author that has an accessibility checker built in. Content created with Open Author can be downloaded in EPUB format.
- [Clusive](#) has a library that includes titles from a number of state and national standards-aligned public domain sources, including the Library of Congress’s Amazing American series, texts from Tar Heel Reader and more.

Learners will need an app, device, or online service to open, read, and navigate the content in EPUB titles. These are known as reading systems and can be built in, free to download and install, or available for purchase (refer to Appendix A). Accessibility support varies across these reading systems, as do the customization features they support. The Inclusive Publishing website has an excellent [roundup of reviews for some of the most popular reading systems](#) with support for EPUB.

Reading EPUB on a Chromebook

There are several ways that a learner using a Chromebook can open an EPUB title and start creating a customized reading experience for themselves:

- The [Clusive](#) online EPUB reader from CAST is pre-loaded with a number of EPUB titles. Learners can use this tool to explore the many accessibility and personalization features the format supports before they download and install one of the readers listed in Appendix A. Clusive also supports integration with Bookshare. Learners can sign into their Bookshare account from Clusive to find and open Bookshare EPUB titles that match their interests.
- The [Bookshare Web Reader](#) can be quickly accessed using the “Read Now” button on many Bookshare titles.
- The web version of Google’s [Play Books](#) can open any EPUB title that has been purchased from Google on a Chromebook.

Some Chromebooks are capable of running Android apps, which makes it possible to use some of the Android reader apps listed in Appendix A.

Reading EPUB on an iPad

Apple includes a built-in reading app that supports EPUB on its devices. Known as [Apple Books](#), it includes basic display options such as adjusting the text size, choosing a different font, and themes (text/background color combinations). Apple’s Book Store is integrated into the app, which makes it easier to find and purchase EPUB titles. A selection of free titles, often created from public domain sources, is also available from the Book Store.



Creating EPUB

Teachers already create content in Word and PDF format, and it is also possible to easily create EPUBs with additional accessibility features. A number of authoring tools support exporting to the EPUB format: Pages on Apple devices, Google Docs, and Microsoft Word to name just a few. Not all of these tools have 100% support for accessibility when creating the source file from which the exported EPUB title will be created. This is crucial to ensuring that files shared with students support accessibility and other features for the best reading and learning experience.

Accessible EPUB publication can be created with just a few clicks in Microsoft Word for Windows using the free [WordToEPUB plugin](#) from the DAISY Consortium:

1. Author your content according to accessibility best practices (e.g., properly nested headings, descriptive hyperlinks, and images with alternative text).
2. Perform an accessibility check on the source document and fix any problems the checker identifies (select Review on the tool bar and then Check Accessibility).
3. Export to EPUB by selecting the WordToEPUB button in the Ribbon and following the prompts.

It is recommended that you open the exported EPUB file with one of the free tools listed in Appendix A.

NIMAS and Accessible EPUB

Under the provisions of IDEA 2004, states and districts can require files in the National Instructional Materials Accessibility Standard (NIMAS) for K–12 printed textbooks and related core instructional materials as a part of their adoption contracts and purchase agreements with publishers. NIMAS files expedite the production of accessible formats of publisher materials. For more information about NIMAS, visit the [National AEM Center website](#).

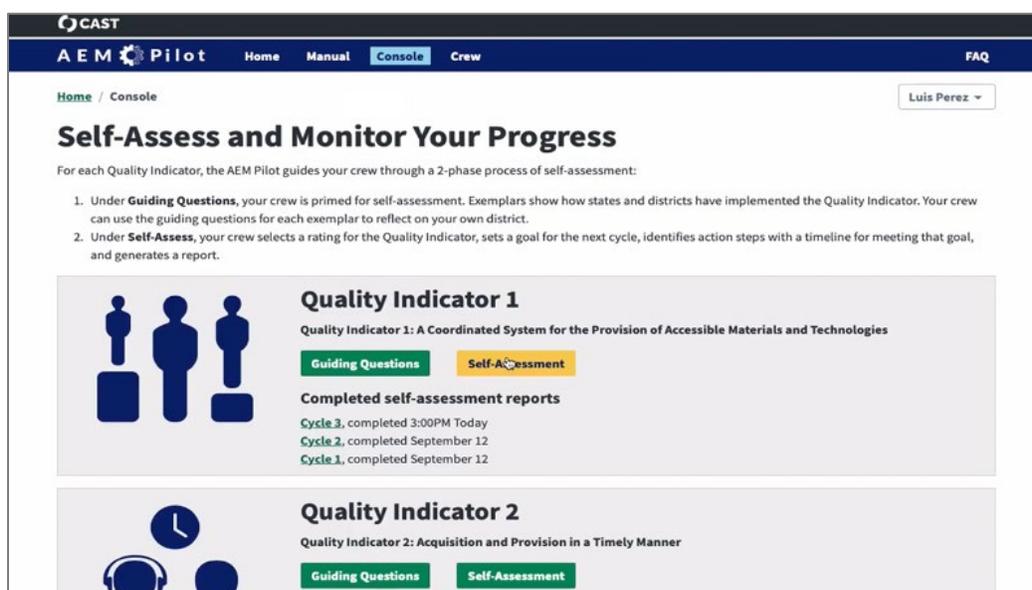
A [Notice of Interpretation \(NOI\) from the U.S. Department of Education in May of 2020](#) clarified that the National Instructional Materials Access Center (NIMAC) may also accept NIMAS files for digital instructional materials when those materials can be prepared in valid NIMAS format. The NOI further states that digital instructional materials that already meet the accessibility criteria in WCAG 2.0 AA are exempt from NIMAS requirements. In light of the benefits that accessible EPUB offers to students, states and districts are encouraged to procure accessible digital materials in EPUB format when this is an option.

For more information about NIMAS and digital materials, contact the NIMAC at nimac@aph.org.

Creating a Coordinated System for Providing Accessible Materials

Getting to where you want to be.

The National AEM Center's "[AEM Pilot](#)" is an interactive utility designed to guide district teams in the creation of coordinated systems for providing timely and high-quality accessible materials and technologies.



The screenshot shows the AEM Pilot web application interface. At the top, there is a navigation bar with the CAST logo, the title "AEM Pilot", and menu items for "Home", "Manual", "Console", "Crew", and "FAQ". Below the navigation bar, the user "Luis Perez" is logged in. The main heading is "Self-Assess and Monitor Your Progress". Below this, there is a brief description of the self-assessment process and two numbered steps: 1. Under **Guiding Questions**, your crew is primed for self-assessment. Exemplars show how states and districts have implemented the Quality Indicator. Your crew can use the guiding questions for each exemplar to reflect on your own district. 2. Under **Self-Assess**, your crew selects a rating for the Quality Indicator, sets a goal for the next cycle, identifies action steps with a timeline for meeting that goal, and generates a report. The interface displays two Quality Indicators. Quality Indicator 1 is titled "Quality Indicator 1: A Coordinated System for the Provision of Accessible Materials and Technologies" and has buttons for "Guiding Questions" and "Self-Assessment". Below it, it shows "Completed self-assessment reports" for Cycle 3 (completed 3:00PM Today), Cycle 2 (completed September 12), and Cycle 1 (completed September 12). Quality Indicator 2 is titled "Quality Indicator 2: Acquisition and Provision in a Timely Manner" and also has buttons for "Guiding Questions" and "Self-Assessment".

While not exclusively focused on EPUB, the AEM Pilot prompts a systemic review of district policies and procedures, and identifies key checkpoints and indicators that lead to increased academic opportunities for all students.

[A five and one-half minute video](#) gives an overview of the AEM Pilot.

Conclusion

The EPUB format is used for creating accessible, customizable, and adaptable publications and documents, from publisher textbooks to student-created materials. This guide provided a detailed overview and recommendations for adopting materials in the EPUB format in K–12 schools. After thoughtfully using this guide, individuals and teams should have a basic understanding of the EPUB format: what it is, why it's different from

other file formats, how it benefits learners, and where high-quality EPUB titles are available for use. Users of this guide should also be prepared to self-explore the personalized reading experiences offered by EPUBs, as well as to practice skills for creating accessible EPUBs using everyday authoring tools.

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Appendix A: EPUB Reading Solutions

For platforms that do not have a built-in reader (or when learners want to go beyond the basic features supported on those apps), there is the option to install a reading app by downloading it from the appropriate app store:

- [App Store](#) for Apple devices, such as iPhone, iPad and the Mac
- [Google Play Store](#) for Android devices and some Chromebooks
- [Windows Apps Store](#) for Windows
- [Fire App Store](#) for Fire tablets

The following free apps provide a good starting point for exploring the world of EPUB reading apps:

- [Dolphin EasyReader](#) (Windows, iPad and iPhone, Android, Fire tablets): this free app includes a number of customization features for a flexible reading experience, including an integrated read aloud feature with a number of high-quality free voices and the ability to add paid voices in a number of languages. Along with integrated access to Bookshare, learners can also download public domain titles from Project Gutenberg directly into the app.
- [Thorium Reader](#) (Windows, Mac, Windows and Linux. Along with Read Aloud with line and word highlight and flexible display options, Thorium Reader includes support for math notation., Mac, Windows and Linux. Along with Read Aloud with line and word highlight and flexible display options, Thorium Reader includes support for math notation.

Paid Reading Apps

- [Voice Dream Reader](#) (iPad and iPhone): learners can load EPUB titles directly from online repositories such as Bookshare and Project Gutenberg, or download them from file storage services such as Dropbox, iCloud and Google Drive. Similar to Dolphin EasyReader, learners can use a number of built-in options to customize the highlighting of content as it is read aloud and other display options. The app supports the built-in voices on each device, as well as commercial voices from Acapela, with one free premium voice already included with purchase.
- [Texthelp EPUB Reader](#) (Web): this Progressive Web App (PWA) includes many of the tools that will be familiar to learners who already use Texthelp's Read&Write extension, including text-to-speech. To read EPUB titles with the Texthelp EPUB Reader, learners can open them from Google Drive or download them and use the Windows or Mac desktop version of the EPUB Reader.