

#A11Y: EC Summer Institute on Accessibility

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OVERVIEW

In this lesson, P-16+ administrators and educators were introduced to the rationale for creating accessible digital content, differences in terminology, and accessibility considerations through materials that were developed internally. Throughout the lesson, learners were presented with a variety of resources and were given the opportunity to apply the concepts. This two-day-long Summer Institute was designed for P-16+ individuals who are responsible for designing and/or procuring digital instructional content. The lesson was presented to K-12 educators throughout North Carolina who attended the 2022 NC Exceptional Children's Summer Institute.

Topics: AEM Quality Indicators, Americans with Disabilities Act, Assistive Technology, Instructional Design, POUR Principles, Section 504 and 508, Semantic Structure, Universal Design for Learning, WCAG Standards

Time: Two 6-hour workday sessions

MATERIALS

Materials are listed per day. See Day One: Morning, Day One: Afternoon, Day Two: Morning, and Day Two: Afternoon sections.

SET UP

Set Up is listed per day. See Day One: Morning, Day One: Afternoon, Day Two: Morning, and Day Two: Afternoon sections.

CONTEXT-AT-A-GLANCE

Setting

The two-day statewide institute was held in a standard sized classroom on the University of North Carolina Greensboro campus which was chosen due to its central geographic location in the state.

Modality

Face-to-face sessions or online with synchronous and asynchronous interactions

Class Structure

The two-day Institute consisted of four, three-hour sessions. Participants sat at tables where space was provided to work independently and collaboratively.

Organizational Norms

North Carolina is participating in the National Accessible Educational Materials (AEM) Cohort program, and this workshop was designed to introduce participants to the AEM Cohort program and to increase accessibility efforts statewide.

Learner Characteristics

Educators and administrators ($N = 21$) attended the workshop and were not required to have any prior accessibility knowledge.

Instructor Characteristics

Five state-level educational leaders with experience in serving special populations collaborated to develop and facilitate the activities.

Development Rationale

This institute was designed to address the need for creating and procuring accessible educational materials by investigating the human impact that non-accessible content can have on learners.

Design Framework

Framework for Accessible Specification of Technologies, Universal Design for Learning, Web Content Accessibility Guidelines, POUR Principles

STANDARDS

The WCAG Website Compliance Standards (Accessibility Works, 2023) were utilized in this institute:

- “Information and user interface components must be presentable to users in ways they can perceive.” (Perceivable)
- “User interface components and navigation must be operable.” (Operable)
- “Information and the operation of the user interface must be understandable.” (Understandable)
- “Content must be robust enough that it can be interpreted reliably by a wide variety of user agents, including assistive technologies.” (Robust)

CONTEXT AND SETTING

This lesson was developed as part of a two-day Summer Institute which was organized to support the needs of exceptional children. The purpose behind the lesson was to support the North Carolina Department of Public Instruction’s Accessible Educational Materials Leadership Teams’ goal of developing a statewide comprehensive coordinated system for providing accessible technologies and content across the continuum of educational services throughout the state.

The two design frameworks that were used to guide this lesson, Universal Design for Learning (UDL) and the POUR principles were chosen based on their focus on human-centered design. Baran and Alzoubi (2020) developed a three-module course, and one module focused on the human-centered design connections between UDL and accessibility. The Accessibility and UDL module employed a design approach that required participants to examine the diverse needs of learners to provide equitable access to learning materials and analyzed accessibility features of web-based instructional content and discussed design solutions. Mason et al. (2021) discussed the human-centered focus that is associated with concepts of perceivability, operability, the ability to be understood, and robustness that form the foundation for the POUR framework. The word “user” is included in the

descriptions for three of the four POUR framework concepts.

While the materials presented in this lesson come from well-known design frameworks like UDL and Web Content Accessibility Guidelines (WCAG), the lived experiences of those dedicated to serving visually impaired and/or deaf or hard of hearing students and others in low incidence populations were used to provide additional context and setting for the lesson. The lived experiences came from in-person observations and interviews with students and faculty at the three state-led residential schools for the blind and deaf/hard of hearing, along with similar experiences in public and charter schools across the state.

Rather than addressing accessibility as a legal requirement, this lesson was designed to capture the human perspective of how inaccessible content can potentially impact learners. Horton and Quesenbery (2014) used a similar approach when they developed eight realistic fictitious characters with names, personal attributes, and physical abilities to guide the design of accessible web-based user experiences. Statistical data from the World Organization to the United States Census Community Population Survey and the lived experiences of individuals Horton and Quesenbery met as colleagues, read about in blogs, and worked with during research sessions were used to develop the eight characters. Similar to that process, the developers for this lesson generated four fictitious characters based on interactions with students, educators, administrators, and colleagues from academic conferences and research sessions.

Micah, Courtney, Jeremy, and Gabriella are fictitious characters created to represent individuals with various disabilities. Throughout this lesson, readers will learn more about each of their backgrounds and how content design can impact each type of individual.

LEARNING REPRESENTATION

INTRODUCTION-SETTING UP A SAFE SPACE

During this lesson, italic text identifies questions or prompts for the learners. A suggested script is also provided in the notes section for each slide of the PowerPoint presentations.

Prior to the start of the lesson, the following norms were presented and agreed on by all learners who attended the Summer Institute sessions (see attached Day One Morning PowerPoint-#A11Y_EC Summer Institute on Accessibility, slide 3).

- Embrace a culture of empathy.
- Focus on building capacity.
- Be solution oriented.
- Share expertise.
- Honor a safe space for all learners to grow.

Every learner who participated in the two-day Summer Institute brought their own unique perspectives, personal and professional skillsets, and varied levels of prior experience with the topic of accessibility to the table. Establishing these norms from the beginning of the lesson is important to allow all participants to feel comfortable with sharing what they did and did not already know for growth and new understanding to occur.

Following the establishment of norms for the duration of the Summer Institute sessions, participants were introduced to the lesson setting and structure (see attached Day One Morning PowerPoint-#A11Y_EC Summer Institute on Accessibility, slide 4). The two days were broken down into four, three-hour sections:

- **Day One Morning**-Establish a Common Understanding, Define Terminology, and Recognize Various Abilities and Needs.
- **Day One Afternoon**-Consider Digital Accessibility and Introduce Quality Indicators.
- **Day Two Morning**-Determine Student Needs and Explore Needs Assessment Resources.
- **Day Two Afternoon**-Acquire Accessible Formats and Personalize the Learning Experience.

DAY ONE MORNING

MATERIALS

RESOURCES

- Computer with Internet and Google Drive / Microsoft Office 365 access
- Personal headphones are preferred but are not required

HANDOUTS AND PRESENTATIONS

- [Day One Morning PowerPoint-#A11Y_EC Summer Institute on Accessibility](#)
- [Course Development Training-Accessibility](#) articulate storyline (Smith, n.d.)

WEBSITES AND ARTICLES

- National Center on Accessible Education Materials [AEM] (n.d.i) "[What is Accessibility?](#)" website
- [SETT Framework website](#) (Zabala, n.d.)
- The Cheesecake Factory (n.d.) menu

AUDIO AND VIDEO

- [Jane Velkovski: The life-changing power of assistive technologies](#) (TED, 2022)
- [Assistive Technology in Action-Meet Elle](#) (Pacercenter, 2012)
- [Assistive Technology Devices in Action for People with Disabilities](#) (The Disability Law Center of Virginia, 2021)
- [Start a Conversation: Accessible Learning Across the Lifespan](#) (National Center on AEM, 2022c)

SETUP

Day One Morning can be presented through either an in-person or online modality. If the session is being presented in-person, the space should be set up to allow participants to view the presentations and resources being shared through projecting on a screen, but the space should also provide enough room for participants to move around and interact with each other. A lab setting where each participant has access to their own computer is preferred, however, a computer lab setting was not available at the location during the two days the Summer Institute took place.

If an online format is being used, some of the content can be presented asynchronously using the flipped classroom model, however, the interactive aspects of the lesson will require the use of video conferencing software that includes the ability to set up breakout rooms. For the Day 1 Morning session, breakout rooms are needed to complete the following interactive activities:

- Meet Our Students Jigsaw Activity.
- Essential for Some, Beneficial for All Whole-Group Activity.

- The Cheesecake Factory Menu Think-Pair-Share Activity.

A shared Google Drive folder was provided to participants that contained access to the resources that were used over the course of the two days— including slide presentations, handouts, and activity documents.

INTRODUCTION

The Day One Morning Session began by establishing a common understanding for why accessibility is important, which is two-fold (see attached Day One Morning PowerPoint-#A11Y_ EC Summer Institute on Accessibility, slide 5):

1. There are significant laws which include Section 508 and the Americans with Disabilities Act (ADA) that must be addressed.
2. There are moral and ethical considerations, which are much more personal, called Human Factors.

THE LEGAL ASPECTS

A high-level overview of the key components of the Individuals with Disabilities Educational Act (IDEA); Section 504 of ADA; and Section 508 were highlighted on the Day One Morning presentation (see attached Day One Morning PowerPoint-#A11Y_ EC Summer Institute on Accessibility, slides 6-7). When discussing the legal aspect of accessibility, it is important to explain the role the Department of Education’s Office of Civil Rights (OCR) plays in ensuring the legal aspects are adhered. Any individual who experiences difficulties with accessing electronic content in an educational setting can file a complaint with the OCR. Once the complaint has been received by the OCR, they will send a letter to the entity that had the reported violation. The letter identifies the areas of concern that must be addressed and the time frame to resolve them. In 2022, the United States Department of Education’s Office of Civil Rights received a total of 18,804 OCR complaints of which 6,467 (32%) were related to disability concerns (Lhamon, 2023). Over half (3,363) of the total number of complaints filed involved issues tied to providing and receiving a free and appropriate public education, 1,028 were tied to academic adjustments, and 1,856 were over different treatment, exclusion, and/or denial of benefits.

HUMAN FACTORS

Accessibility ensures that everyone has an equal opportunity to learn and access information. As educators and designers begin to think about accessibility from an instructional perspective, the focus must remain on the learners who serve as consumers for lessons, activities, and communication. However, educators and designers must remain cognizant of family members and/or caregivers that often support learners at home (see attached Day One Morning PowerPoint-#A11Y_ EC Summer Institute on Accessibility, slide 8).

For students with an Individual Education Plan (IEP), parent counseling and training can and should be offered as a related service. All correspondence (e.g., letter, memos, webpages, etc.) should also be made accessible. Colleagues, who require accessible materials, must be considered as well. Organizations may have someone on staff who relies on a screen reader or captioning to access digital content or requires printed materials in a large font. The tips and guidance that were presented and discussed throughout the two-day Summer Institute were intentionally designed to address all three types of constituents. Accessible features and materials are required for some but good for all.

MEET OUR STUDENT’S JIGSAW ACTIVITY

Jigsaw activities are a form of cooperative learning which were developed to help with scaffolding or breaking learning materials down into smaller chunks as learners teach others the piece of the puzzle (new content) they learned (Gusta et al., 2020). The Meet Our Students Jigsaw Activity was developed to immerse learners in the various levels of impact accessibility-related concerns have on diverse learners. Four fictitious student profiles were created to address the more common accessibility concerns which include visual, motor, and cognitive impairments along with individuals that may be deaf or hard of hearing (see attached Day One Morning PowerPoint-#A11Y_ EC Summer Institute on Accessibility, slide 9). The fictitious profiles are:

- Micah, who represents a student who is visually impaired. Micah uses screen reading technology to interact with digital content.
- Jeremy, who represents a student with cerebral palsy (motor impairment). Jeremy uses keyboard

controls to navigate content and relies on the use of speech operated software to control his computer.

- Courtney, who is deaf and communicates through sign language but prefers captions and transcripts rather than an Interpreter when navigating digital content.
- Gabriella, who suffered from a traumatic brain injury (cognitive impairment) and needs information broken into smaller chunks, content area text to be read aloud, and instructional videos that are less than ten minutes in length.

While Gabriella’s profile states that she suffers from a traumatic brain injury, her considerations may also be needed for students with ADD, ADHD, and/or Dyslexia. The profiles may be used for different or multiple disabilities. Many students are listed as having multiple disabilities such as deaf blindness, but only these four basic profiles were developed for the purpose of the Summer Institute.

For the jigsaw activity, learners were separated into four groups and asked to explore the [Course Development Training-Accessibility](#) articulate storyline (Smith, n.d.) from the perspective of one of the four students. Each group was assigned a specific student to explore and report. Learners were given approximately 15 minutes to review the information on their assigned student and investigate the [Course Development Training-Accessibility](#) articulate storyline (Smith, n.d.) through the perspective of their student. Following the conclusion of the investigation, learners were brought back as a whole group to present their findings (10-15 minutes). After this presentation, a 10-15 minute break was given.

DEFINING TERMINOLOGY

It is important to establish common definitions for accessibility, assistive technology, and UDL at the beginning of the lesson (see attached Day One Morning PowerPoint-#A11Y_EC Summer Institute on Accessibility, slides 10-12). The term accessibility has been associated with other technical concerns such as Internet connectivity. The common definition for accessibility in this lesson was:

A person with a disability can acquire the same information, engage in the same interactions, and enjoy the same services in an equally effective, equally integrated manner, with substantially equivalent ease of use as a person without a

disability. (U.S. Department of Education, 2013, para. 3)

Content created and delivered digitally must be accessible to any individual with a:

- Visual impairment.
- Orthopedic impairment.
- Hearing impairment.
- Cognitive impairment.

According to the Assistive Technology Industry Association (n.d., What is AT?), the term assistive technology refers to a set of products, equipment, and systems that have been developed to break down barriers individuals may experience in a learning environment. The short Assistive Technology YouTube video was shown to demonstrate some examples of assistive technologies in action (see attached Day One Morning PowerPoint-#A11Y_EC Summer Institute on Accessibility, slide 13; MSFTEnable, 2021). To capture the human impact of assistive technology, the following videos can be shared with learners to view independently outside of the session (if the lesson is running ahead of schedule, participants can choose from the following videos to explore during the session):

- Jane Velkovski TED video (mobility; TED, 2022).
- Assistive Technology in Action-Meet Elle (eye gaze and Dynavox; Pacercenter, 2012).
- Assistive Technology Devices in Action for People with Disabilities (low-tech examples; The Disability Law Center of Virginia, 2021).

Assistive technology is specific to one person. While accessibility considers specific disabilities, individuals have specific needs that may not be met by accessibility standards alone. Individuals who fall into this category need tools that improve their functionality. Therefore, a team of specialists work with students to identify unique needs and determine the best assistive technology options to support each student.

Dr. Joy Zabala developed the SETT Framework (Zabala, 2020) which promotes collaborative decision-making when (see attached Day One Morning PowerPoint-#A11Y_EC Summer Institute on Accessibility, slide 14):

- Identifying assistive technology services for students with disabilities.

- Implementing assistive technologies within an educational setting.
- Evaluating the effectiveness of the assistive technology implementation.

SETT stands for:

- S: Student-The individual’s strengths and needs.
- E: Environment-Where the individual will be completing the task.
- T: Task-The specific things the student needs to be able to do to meet expectations.
- T: Tools-The specific tool or tools that will be essential for the individual to complete the tasks.

ESSENTIAL FOR SOME, BENEFICIAL FOR ALL WHOLE-GROUP ACTIVITY

Following the terminology information, learners were presented with the following scenarios and were asked to respond physically by raising hands or nodding their head or auditorily by answering “yes” or “no” to identify situations they may have experienced (see attached Day One Morning PowerPoint-#A11Y_EC Summer Institute on Accessibility, slide 15).

Have you ever:

- *Turned on captions because the audio being presented during a movie or other settings could not be understood or heard?*
- *Found it difficult to read colored text on a colored background?*
- *Experienced fluency issues with trying to read text that was written in cursive or using script fonts?*
- *Been overwhelmed by too many images, colors, and/or text on a page?*
- *Been unable to navigate a webpage or digital content because your mouse stopped working?*
- *Used keyboard commands to copy and paste content?*

If time allows, provide learners with the opportunity to add two or three additional scenarios related to accessibility concerns for the group to respond to. After completing the interactive activity, stress how building accessible content for those with disabilities also benefits others (see attached Day One Morning PowerPoint-#A11Y_EC Summer Institute on Accessibility, slide 16). A conscious effort to provide accessible digital material enhances the usability and learning experience for everyone.

This activity leads into a discussion about UDL. There is no ‘one way, one size fits all’ way of delivering content. A person who uses the UDL principles accounts for a multitude of factors including the content, mode of learning that students best learn from, equal access to learning, choice in how information is learned, and choice in how learners show their knowledge from the content (Center for Applied Special Technology [CAST], 2018). UDL principles benefit and are designed with everyone in mind (see attached Day One Morning PowerPoint-#A11Y_EC Summer Institute on Accessibility, slides 16-17). The three main considerations for UDL include:

- Representation.
- Engagement.
- Action and expression.

To conclude the content presentation portion of the lesson, the Summary Venn diagram (see attached Day One Morning PowerPoint-#A11Y_EC Summer Institute on Accessibility, slide 18) was shown and discussed among learners. The diagram was used to provide a visual representation of how all the concepts work together to promote inclusion opportunities for all learners.

Prior to the next activity, a 10-15 minute break was provided.

CONCLUSION/ASSESSMENT

THE CHEESECAKE FACTORY MENU THINK-PAIR-SHARE ACTIVITY

Once the Day One Morning materials were presented and discussed, the interactive Cheesecake Factory Menu Think-Pair-Share activity was used to conclude the session (see attached Day One Morning PowerPoint-#A11Y_EC Summer Institute on Accessibility, slide 19). Considering what was shared about accessibility, assistive technology, and UDL, learners applied the three concepts to an activity where they were asked to analyze the menu from The Cheesecake Factory.

Learners were asked to pair up, access the website for the Cheesecake Factory, and evaluate how the restaurant exhibits accessibility, assistive technology, and UDL. Approximately 10-15 minutes were provided to allow the pairs to explore the menu and

note their ideas. After about 15 minutes, everyone was brought back together to share their findings with the entire group and wrap up the discussion for the session. After this wrap-up, a lunch break was provided with participants returning for the Day One Afternoon session.

DAY ONE AFTERNOON

MATERIALS

RESOURCES

- Computer with Internet and Google Drive / Microsoft Office 365 access
- Personal headphones are preferred but are not required
- Large chart paper
- Post-it notes

HANDOUTS AND PRESENTATIONS

- [Day One Afternoon PowerPoint-#A11Y_EC Summer Institute on Accessibility](#)
- [Accessible Content Design Scavenger Hunt-Document - #A11Y](#)
- [Teacher Guide-Accessible Content Design Scavenger Hunt Document - #A11Y](#)
- [Accessible Content Design Scavenger Hunt Presentation - #A11Y](#)
- [Teacher Guide-Accessible Content Design Scavenger Hunt Presentation - #A11Y](#)
- [Course Development Training-Accessibility](#) articulate storyline (Smith, n.d.)
- [AEM Quality Indicators with Critical Components for K-12](#) PDF (National Center on AEM, 2020a)

WEBSITES AND ARTICLES

- National Center on AEM (n.d.g) [Quality Indicators for the Provision of Accessible Educational Materials & Technologies](#) website

SETUP

The afternoon portion for Day One can be presented through either an in-person or online modality. If the session is being presented in-person, the space should be set up similarly as the Day One Morning session: to allow participants to view the presentations and resources being shared through

projecting on a screen, but the space should also provide enough room for participants to move around and interact with each other. A lab setting where each participant has access to their own computer is preferred, however, a computer lab setting was not available at the location during the two days the Summer Institute took place.

If an online format is being used, some of the content can be presented asynchronously using the flipped classroom model, however, the interactive aspects of the lesson will require the use of video conferencing software that includes the ability to set up breakout rooms. For the Day One Afternoon session, breakout rooms are needed to complete the following interactive activities:

- Creating Accessible Documents and Presentations Scavenger Hunt Activity.
- AEM Quality Indicators Group Wonders and Wows Activity.

For the AEM Quality Indicators Group Wonders and Wows Activity, if completed in an in-person setting, space is needed for learners to be able to move around the room and for large chart paper to be posted on tables or on the walls.

INTRODUCTION

Before getting into the content for the afternoon session, it is important to review the norms that were agreed upon by learners and presenters at the beginning of the morning session (see attached Day One Afternoon PowerPoint-#A11Y_EC Summer Institute on Accessibility, slide 2).

The Day One Afternoon session began with a review of the key characteristics associated with the fictitious characters of Micah, Jeremy, Courtney, and Gabriella (see Day One Afternoon PowerPoint-#A11Y_EC Summer Institute on Accessibility, slide 3). During the morning session, accessible design considerations (e.g., formatting text, hyperlinks, and tables, as well as providing alternative text, closed captions, transcripts, and audio descriptions) were introduced when learners worked through the [Course Development Training-Accessibility](#) articulate storyline (Smith, n.d.) activity. During the afternoon session, each of these design considerations were explored in more depth.

As discussed in the morning session, very few IEPs, Section 504 Plans, and/or individual student needs are the same. Addressing accessibility and instructional design is not a simple checklist that is addressed once and never revisited. Instead, it is a continuous process which involves constantly adding new instructional supports to digital content and courses (see attached Day One Afternoon PowerPoint-#A11Y_ EC Summer Institute on Accessibility, slides 4-6). Some of the main areas of concern related to accessibility in education include:

- Content delivery/learning management systems (e.g., Canvas, Brightspace, Moodle, Blackboard, Google Classroom, SeeSaw).
- School, institutional, or organizational websites, teacher/faculty websites, and social media.
- Textbooks and educational materials.
- Software.
- Files.

When developing or evaluating instructional and educational content, it is important to keep the following accessibility considerations in mind:

- Visually impaired learners' use of screen readers, audio descriptions and Braille displays (Micah).
- Deaf or hard of hearing learners use open/closed captions and transcripts (Courtney).
- Muscularly impaired learners may use speech-to-text software, keyboard controls only, eye gaze technology, and/or different types of switches (Jeremy).
- Cognitively impaired learners may rely heavily on different aspects of UDL along with some of the other technologies previously identified in this considerations section (Gabriella).

ACCESSIBILITY AREAS OF CONCERN

The next section of the lesson provides some steps for designing digital instructional content to better ensure that those who rely on assistive technology can interact with the content independently.

MAKING TEXT ACCESSIBLE

To ensure text accessibility is addressed properly, the following steps should be taken (see attached Day One Afternoon PowerPoint-#A11Y_ EC Summer Institute on Accessibility, slide 7):

- *Color should not be used independently to emphasize text. If color is used for emphasis, bold and/or italics font styles should also be used and contrast between the text and background colors should meet WGAG 2.0 Standards.*
- *Underlining should only be used for hyperlinks and not for emphasizing content.*
- *Aside from text used to create captions or text that is embedded in images, the text should be resizable up to 200 percent without the use of assistive technology (WCAG 2.2).*
- *Forget funky fonts. Often people ask what the "best fonts" are. This is a topic that has been widely debated, but the less complicated and clearer the font is, the better. A San Serif font without the extra strokes and lines tends to be better.*
- *Semantic structure is very important. This involves the built-in structure in word processing, presentation, and rich content editor technologies that allow content creators to format text using paragraph, title, and heading levels.*

When the proper semantic structure is used during the content design process, screen reader and keyboard only users (Micah and Jeremy) can use assistive technologies to navigate through different parts of the text using keyboard shortcuts. If a semantic structure is not configured properly, users can only interact with the content in its entirety and cannot navigate back and forth through different parts of the content.

HYPERLINKS

Phrases like "Click Here" or "Here" used for linking content in an email, on a document, or on a webpage can cause accessibility issues (see attached Day One Afternoon PowerPoint-#A11Y_ EC Summer Institute on Accessibility, slide 8). Screen reading technology allows users (Micah) to choose an option that pulls out a list of all the URLs or web links on a page. The software then audibly reads the list of links to users. If there are 10 links on a page and they are all labeled "Click Here," the screen reader would read "Click Here" 10 times in a row and the user would not know what each link was, nor where it led.

Non-descriptive hyperlinks also cause problems with voice-controlled software like Dragon Naturally Speaking (Jeremy). Voice-controlled software relies on each aspect of the content having a unique name. If a voice-controlled software were to open the same page with 10 links that are all named "Click Here," all 10 pages would open in either new windows or new

tabs at the same time, which would be very confusing.

When formatting hyperlinks:

- Set them to open in a new window.
- Do not use non-descriptive titles (e.g., *Click Here, Here*).
- Use descriptive titles but do not use actual file names.

For example, instead of writing “Click Here for a transcript of the lesson,” a more descriptive hyperlink could be “The Lesson One Transcript provides a time-coded, detailed description of the contents discussed in the video.” Readers should notice the descriptiveness of the hyperlink in the second example and how the additional context indicates what the hyperlink would provide.

KEYBOARD NAVIGATION ACTIVITY

To begin this activity, a variety of keyboard shortcuts were presented on slide nine of the Day One Afternoon PowerPoint-#A11Y_ EC Summer Institute on Accessibility (attached). The slide shows keyboard shortcuts for both MAC and PC users. Some examples of the tasks presented on the slide include:

- Select, copy, cut, paste, bold, or italicize text.
- Insert hyperlinks.
- Print or save as a PDF.
- Undo and/or redo the last action.

For this activity, learners navigated to the Reading Rockets (n.d.) website and were asked to navigate the site without use of their mouse and trackpad. This activity needed to be completed on a laptop or desktop device and would not be optimal for mobile or touch screen devices (see attached Day One Afternoon PowerPoint-#A11Y_ EC Summer Institute on Accessibility, slide 10). Learners tried to use keyboard shortcuts to:

- Move forward (Tab).
- Move backwards (Shift + Tab).
- Open a link or button (Enter).

If time allows, other keyboard shortcuts can be tested. While learners navigated the site using their keyboard, presenters moved around the room to assist with problems.

READING ORDER

When a keyboard is used for navigation (Jeremy) or a screen reader (Micah) is used, the order that items are read is very important (see attached Day One Afternoon PowerPoint-#A11Y_ EC Summer Institute on Accessibility, slide 11). In documents and on web pages, the reading order is determined using the semantic structure discussed in the previous *Making Text Accessible* section. However, in presentations, the reading order is determined by the order in which items were placed on each slide. When designing presentations, it is best to use one of the available pre-built slide layouts, because the proper reading order has been set. When integrating additional items (e.g., textboxes, images, audio, video) into prebuilt layouts or if prebuilt layouts are not used, the reading order will need to be checked for each customized slide. Microsoft has included a feature in their built-in Check Accessibility tool that scans the entire presentation and brings up a single report with reading order errors (PowerPoint reading order tutorial document; Microsoft, n.d.). The process is not as intuitive in Google Slides. To test the reading order for a Google Slides presentation, the following steps must be taken:

1. Click on each slide one-at-a-time in the order they appear.
2. Click on the first item on the slide then press the Tab button on the keyboard to navigate from one item to the next. Use Shift + Tab to navigate backwards.
3. If there is an item that is out-of-order, right-click on that item, hover over Order, and click either Send Backwards or Send Forward to adjust the reading order for each object.
4. Repeat this process for each slide in the presentation.

Google Slides does not currently provide a way to scan the reading order for an entire presentation at one time, nor does it provide the comprehensive reading order report. However, the amount of work associated with adjusting the reading order can be minimized by using the following strategies:

1. Use pre-built slide layouts and try to limit the addition of new content outside the spaces provided.
2. When content outside of a pre-built layout must be added, the reading order is determined by the order that content is added to the slide. If three text boxes are added by creating one and duplicating it two times, the reading order of the

boxes can get mixed up. It is best to add each item as a new textbox one at a time.

3. Once the design for each slide is completed, check the reading order for that slide before moving on to the next slide. Checking the reading order for each slide individually during the design process will minimize the amount of revision work that has to be done once the presentation is complete.
4. Anytime content is moved, added, and/or deleted on a slide during the revision process, always remember to double-check the reading order.

ALTERNATIVE TEXT FOR IMAGES

All non-text and non-video elements such as images, charts, graphs, and so forth must include alternative (alt) text (see attached Day One Afternoon PowerPoint-#A11Y_ EC Summer Institute on Accessibility, slides 12-13). Alt text is a feature that screen readers use to describe the contents of an image to someone who may be visually impaired (Micah). The following concepts should be considered when adding alternative text to images:

- Phrases like, “picture of” or “image of” should be avoided because the screen reader alerts learners that they are interacting with pictures/images.
- Descriptions should be clear, concise, and brief for simplistic images. More complex images may require longer descriptions that can be added to a separate slide or document and linked to.
- Images that are used for decorative purposes should use open quotes (“ ”), which tells the screen reader to ignore the image. Please note: This strategy should not be used to avoid adding alt text to important images. Additionally, the use of purely decorative images should be limited as they can become distracting.

Four different images are presented on the Adding Appropriate Alt Text, slide 13, of the Day One Afternoon PowerPoint-#A11Y_ EC Summer Institute on Accessibility. Explanations for possible alt text for the four images are:

- Top left image: A sketch of Pythagoras. The alt text may be different for the image based on how it is used. If the image is used with an introduction to the Pythagorean Theorem in a math course, stating it is a sketch of Pythagoras is enough. However, if the image was added to an assignment in an art class, it would require the addition of a more

descriptive explanation for the colors, mediums, and other important artistic features. While it is stated that “picture of” or “image of” should not be used, the phrase sketch of can be used because it describes a more specific type of image.

- Bottom left image: George Washington crossing the Delaware with his army. Again, if the image was added to a history course, this would be sufficient alt text. However, when adding the image to an art class, it might be important to note that the image is an oil painting on canvas along with other artistic details.
- Top right image: This image is a little more difficult to identify. It is supposed to represent a decorative divider that might be used to separate content on a page. In this particular case, the image would not be adding any instructional value to the page, therefore, it would be given the open quotes (“ ”) for alternative text.
- Bottom right image: A mathematical function. When accessibility first started receiving attention, the common strategy for making math content accessible was to add equations, functions, and other expressions as images and to give them alternative text like what someone might do in a read-aloud situation. However, mathematical content should be added as text using the MathML markup language as opposed to images with alternative text. More information about the MathML markup language will be presented on day two of the Summer Institute. If content designers were forced to add the function represented in this example as an image, the alt text would read, “f of x equals twelve minus x squared.”

EMBEDDED TEXT ON IMAGES

Text that is embedded in images cannot be picked up or read by screen-reading technology (Micah). The use of text embedded in images should be limited to essential situations. When images with embedded text are added to online content, all text content found in the images must be displayed in an alternative format. According to the perceivable aspect of the WCAG POUR framework, text alternatives for non-text content such as images is required so that the content can be easily converted into other needed form including large print, braille, speech, symbols, or simpler language (W3C Web Accessibility Initiative, 2019).

For the two examples on the slide titled Embedded Text on Images (see attached Day One Afternoon PowerPoint-#A11Y_ EC Summer Institute on

Accessibility, slide 14), the first image shows a comic strip with a boy and a girl speaking to each other. To make that image accessible, an additional document, in the form of a script with speaking parts, could be created and linked above the image.

The second image is a pie chart representing the different religions around the world. The percentages for each religion are important on the chart and not the different colors. To make the chart accessible, an additional document was created that included a list of the religions and their percentages from greatest to least. If this pie chart were part of a mathematical problem, the greatest to least part of the description might need to be left off, depending on what the math problem asked students to solve.

CREATING ACCESSIBLE TABLES

Tables should always be created using the text editor feature built into the software (see attached Day One Afternoon PowerPoint-#A11Y_ EC Summer Institute on Accessibility, slide 15). Tables should never be inserted as screenshots or images. Tables should also not be used for the purpose of making content more visually appealing or to organize content on a page. An example of this would be using a table to center the title of a page with images on both sides of the title. Sometimes, tables are used to get two images and a page title aligned properly but that is not accessible for screen readers (Micah).

Columns and rows in the table should have headers to show how all the items in the different cells in the table align with each other. Screen readers read tables from top to bottom and left to right. Tables should not have cells that are merged or blank.

One way to think about when tables should be used is to consider a calendar. Calendars traditionally have column headers which are the days of the week. The one thing calendars are missing is row headers. To make the calendar accessible, an additional column would need to be added on the left side that contained row headers for Week 1, Week 2, Week 3, etc.

AUDIO AND VIDEO ACCESSIBILITY

Audio files, unless they are a narration of text that is presented on the screen/slide, must have transcripts (Courtney). If the audio is a word-for-word narration of the text that is being displayed, then a note can be added to go along with the audio file letting viewers

know that the audio is exactly what is being shown on the screen (see attached Day One Afternoon PowerPoint-#A11Y_ EC Summer Institute on Accessibility, slides 16-17).

There are two main types of videos. Videos can have speaking parts, or they can be a series of slides or images (that may or may not include embedded text) with music playing in the background. For videos that have speaking parts, captions are required (Courtney and possibly Gabriella). According to Morris et al. (2016), the United States Department of Education's Office of Civil Rights (OCR) requirements include the wording, "as effective as," which "encompasses timeliness, accuracy, and the provision of the content in a manner and medium appropriate to the significance of the message and the abilities of the individual with disabilities" (p. 1).

Captions are covered under the OCR's "as effective as" requirement and can be either open or closed. Open captions are always on the screen and cannot be minimized or closed. Open captions are essentially subtitles that might be added using video editing software. Closed captions allow users to click the CC button to turn captions on and off.

While transcripts for videos with speaking parts are helpful, they do not provide the "as effective as" experience that open or closed captions provide, which is why captions are required and transcripts are recommended. Closed captions have also been shown to benefit a variety of learners beyond those who may be deaf or hard of hearing including visual or non-native English learners (Morris et al., 2016), improving vocabulary, comprehension, word analysis, and motivation (Goldman & Goldman, 1988), and those attempting to learn a second world language (Winke et al., 2010).

Videos that do not have speaking parts and only have music require audio descriptions (Courtney). The audio descriptions are a narration of the information being presented throughout the video. Audio descriptions can be added using video editing software.

YouTube is a great tool that helps with locating videos that already have closed captions and with captioning your own videos. YouTube uses Google's speech-to-text tool to auto caption all videos that are uploaded. Once the video has been auto captioned, YouTube's editing tools can be used to revise the auto captions and improve accuracy.

CREATING ACCESSIBLE DOCUMENTS AND PRESENTATIONS SCAVENGER HUNT ACTIVITY

After the content presentation, participants were engaged in a scavenger hunt with a non-accessible document and presentation file (see attached Day One Afternoon PowerPoint-#A11Y_EC Summer Institute on Accessibility, slide 18). For this activity, learners were able to decide whether they preferred to participate independently, with a partner, or in small groups. Two different files were created for this activity. The first file was a document (Accessible Content Design Scavenger Hunt - #A11Y) that could be opened in Microsoft Word or Google Docs. The second file was a presentation (Accessible Content Design Scavenger Hunt Presentation - #A11Y) that could be accessed through Microsoft PowerPoint or Google Slides. Each of the two files were designed to contain specific accessibility-related issues that were presented earlier in the afternoon session. The activity was divided into two parts.

For the first part of the activity, learners were asked to see how many accessibility issues they could identify in each of the two files. The rule was that they could not use any automatic accessibility checkers to identify the issues and they had to briefly explain each issue that was noted. Approximately 20 minutes was dedicated for learners to identify as many accessibility issues as possible.

After the 20 minutes concluded, everyone came back together as a whole group and learners were asked to identify and explain the errors they found. As each error was identified, the entire group talked through strategies that could be used to fix the errors while instructors demonstrated those steps using the computer and projector. A teacher guide was created to help the instructors with remembering what errors were built into the two files (see attached Teacher Guide-Accessible Content Design Scavenger Hunt-#A11Y and Teacher Guide-Accessible Content Design Scavenger Hunt Presentation - #A11Y).

Prior to the next activity, a 10-15 minute break was provided.

QUALITY INDICATORS FROM THE NATIONAL CENTER OF ACCESSIBLE EDUCATIONAL MATERIALS

One of the driving factors that led to the development of this two-day training was the goal to create a coordinated system for planning, implementing, and evaluating efforts to provide accessible instructional materials and technologies to the students who need them, which is the sole mission of the National AEM Center Cohort program. To accomplish this goal, it is important to collect as much stakeholder input as possible to ensure the final plan is indeed comprehensive. The remainder of the afternoon session for Day One was dedicated to introducing AEM Quality Indicators (Qis) with Critical Components for K-12 (National Center on AEM, 2020a).

AEM QIs can be used to improve accessibility efforts at a system/district, organizational, or state level. Since a big aspect of the AEM QIs is to develop coordinated systems, it would not necessarily be implemented at the school level. Of course, schools that are part of the larger cohort would benefit, learn from, and adjust current practices based on the work of the larger cohort.

Approximately 40 minutes was spent on the first part of this portion of the lesson, which involved the instructors going through the AEM QIs with Critical Components for K-12 document (National Center on AEM, 2020a). The instructors used the document to highlight and discuss each of the QIs and their intent in a whole group setting (see attached Day One Afternoon PowerPoint-#A11Y_EC Summer Institute on Accessibility, slide 19). The seven National Center on AEM (2020a) QIs include:

1. Quality Indicator 1: A Coordinated System.
2. Quality Indicator 2: Provision in a Timely Manner.
3. Quality Indicator 3: Written Guidelines.
4. Quality Indicator 4: Learning Opportunities and Technical Assistance.
5. Quality Indicator 5: Data Collection.
6. Quality Indicator 6: Data Use.
7. Quality Indicator 7: Resource Allocation (p. 2).

As the statements and intent for each QI were presented and discussed, participants were given the opportunity to ask clarifying questions about the indicators. During this time, the session presenters, who are also members of the state AEM Leadership

Team, did not share any discussions the Leadership Team had about each of the indicators. This lack of sharing was purposeful to reduce bias that might have arisen in responses during the follow-up activity.

AEM QUALITY INDICATORS GROUP WONDERS AND WOWS ACTIVITY

For this activity, learners were divided into seven groups (one group per QI). Each group was given a piece of large chart paper and asked to write down ideas that came out of the group discussion as they collaborated to identify wonders and wows for their respective QI (see attached Day One Afternoon PowerPoint-#A11Y_EC Summer Institute on Accessibility, slide 20). Learners were given approximately 15-20 minutes to complete this part of the activity.

Once the initial discussion concluded, the plan was to give each individual learner a few post-it notes so they could participate in a gallery walk where they would provide additional wonders and wows to the chart paper for other groups. However, many participants indicated that they had enjoyed everything that had been presented so far, but that they needed some time to process the information. Given this response from participants, and the limited amount of time left in the day, instructors decided to close out Day One without the post-it notes activity.

DAY ONE WRAP-UP DISCUSSION

Prior to ending the Day One Afternoon session, a brief introduction to the topics for Day Two was presented, which include determining student need, exploring needs assessment resources, acquiring accessible formats, and personalizing the learning experience (see attached Day One Afternoon PowerPoint-#A11Y_EC Summer Institute on Accessibility, slide 21). An opportunity was provided for learners to ask any questions they had, and contact information was shared between the presenters and the learners. Because the two days were set up as individual registration options, there were some participants who were returning for Day Two while others only attended Day One. However, all Day One and Day Two materials were made available to all participants in a shared Google Drive folder. Day One participants who were not able to attend the Day Two session were given an overview of what would be presented and

where those materials could be found. Everyone was very complementary and appreciative at the end of Day One.

DAY TWO MORNING

MATERIALS

RESOURCES

- Computer with Internet and Google Drive / Microsoft Office 365 access
- Large chart paper
- Post-it notes

HANDOUTS AND PRESENTATIONS

- [Day Two Morning PowerPoint-#A11Y_EC Summer Institute on Accessibility](#)

WEBSITES AND ARTICLES

- National Center on AEM (n.d.b) [Decision-Making & Accessible Formats](#) website
- [AEM Navigator](#) website (National Center on AEM, 2021)
- [AIM Explorer](#) Google Play Store website (ATWare Solutions LLC., 2021)
- Don Johnson's (n.d.) [uPar Help Students Access Grade-Level Text](#) website
- [Storyline Online](#) (n.d.) website
- [Lit2Go](#) (n.d.) website
- [SETT Framework Resources](#) website (Zabala, n.d.)
- National Center on AEM (n.d.i) [What is Accessibility?](#) website
- National Center on AEM (n.d.a) [Acquiring Accessible Formats](#) website
- [American Printing House \(n.d.\) for the Blind](#) website
- [Bookshare](#) website (Bookshare A Benetech Initiative, n.d.)
- [LearningAlly](#) (n.d.) website
- [Louis Database](#) website (APH Louis, n.d.)

SETUP

The Day Two Morning session consists primarily of having learners explore a variety of digital resources independently. There two interactive activities that were built into the morning session that can be presented as whole or small group opportunities. If

small groups are used, learners would need space to be able to move around the room. During the Summer Institute, both activities were presented as whole group items where learners remained in their seats. A lab setting where each participant has access to their own computer is preferred, however, a computer lab setting was not available at the location during the two days the Summer Institute took place.

If an online format is being used, some of the content can be presented asynchronously using the flipped classroom model, however, the interactive aspects of the lesson will require the use of video conferencing software that includes the ability to set up breakout rooms. Depending on whether whole or small groups are used, the two following activities would require access to video conferencing software:

- Personalizing Assistive Technology Needs Activity.
- Exploration of AMPs Activity.

INTRODUCTION

Because the two days were set up as individual registration options, some participants returned for Day Two while others were attending who did not attend Day One. As a result, it was important to start Day Two by once again agreeing upon the norms for the day and reviewing the definition for accessibility (see Day Two Morning PowerPoint-#A11Y_EC Summer Institute on Accessibility, slides 4-5).

All participants were reminded that the materials for Day One and Day Two were available in the shared Google Drive folder. Those unable to attend Day One could access the presentations and resources.

BACKGROUND & COMMON UNDERSTANDING

Teams often need to stop to reflect on a student's unique learning preferences and needs to acquire information (see attached Day Two Morning PowerPoint-#A11Y_EC Summer Institute on Accessibility, slide 6). For students who are significantly visually impaired, they may learn more effectively through tactile modes of instruction, often braille. However, they may also benefit from auditory modes of instruction, in addition to their need for tactile materials. Teams need to determine individual student needs based on learner data.

In this session, tools that teams can use to determine student needs, collaborate with the whole team, ensure effective implementation, and use in coordination with assistive technology were explored. In summary, students require information and materials that are accessible to them in formats that may require accommodations and/or assistive technology (AT) that meet their individual needs.

DETERMINING STUDENT NEED

To determine individual student needs for accessibility, teams must have a greater understanding of recommended and available tools. The National Center on AEM (n.d.b) provides a four-step process for providing accessible content to individuals with disabilities who need them (see attached Day Two Morning PowerPoint-#A11Y_EC Summer Institute on Accessibility, slide 7):

- Step 1: Determine the learner's need.
- Step 2: Select the accessible format(s) needed.
- Step 3: Acquire materials in the accessible format(s) needed.
- Step 4: Provide supports needed for learners to effectively use accessible format.

During this session, the four steps were discussed. However, several additional tools were identified throughout the morning session.

The first explored topic was Determining a Learner's Need (National Center on AEM, n.d.c). Teams responsible for determining need should (see attached Day Two Morning PowerPoint-#A11Y_EC Summer Institute on Accessibility, slide 7):

- Be cognizant that some students may require more than one format.
- Consider their student's acquisition level or current use of assistive technology.
- Determine if the student has the appropriate assistive technology or if new AT is required based on their need.
- Remember that some situations may require multiple tools to be used at the same time.

AEM NAVIGATOR

The AEM Navigator (National Center on AEM, 2021) helps to guide and facilitate teams through the four step process from determination (Step 1) to student

acquisition and implementation (Step 4). The AEM Navigator is downloadable and can be completed collaboratively, depending on the team. Generally, it has been shown to be more effective when all team members complete the Navigator collaboratively at the same time. However, there may be times where outside factors impact the ability of the team to work together, therefore, teams can determine the most effective way to complete the AEM Navigator. There are several additional tools available for teams such as a Student Summary Worksheet (National Center on AEM, n.d.c), which could be added to the data collection in the present level of student performance for students who are served under the Individuals with Disabilities Education Act (IDEA). The Student Summary Worksheet is typically completed after all the information has been gathered. However, knowing that teams start at different points of entry for this process, there may already be adequate data to complete the Student Summary Worksheet.

AIM EXPLORER

The AIM Explorer (ATWare Solutions LLC, 2021) is a free downloadable application tool for teams to offer a simulation for assessing students' need for accommodations and accessible materials (see attached Day Two Morning PowerPoint-#A11Y_ EC Summer Institute on Accessibility, slide 9). The application provides grade level text to assess student need and use of common features such as magnification, highlighted text for color, and contrast. This can be used in conjunction with any other tool as a piece of data collection to determine the students' needs.

PROTOCOL FOR ACCOMMODATIONS IN READING

The Protocol for Accommodations in Reading (PAR) is an available download from Don Johnston (n.d.) for assessing a student's needed reading accommodations (see attached Day Two Morning PowerPoint-#A11Y_ EC Summer Institute on Accessibility, slide 10). The PAR is free, however the uPAR is a fee-based subscription that school systems may have. The uPAR is a tool that requires students to complete an assessment and then shows each student's optimal reading method (silent versus read aloud) and reading level (Don Johnson, n.d.). The difference between the free and the paid version is that the paid version includes software that automatically analyzes and tracks student progress.

It also allows teachers to get reports for individuals or the entire class. The free package comes with a teacher guide along with data and scoring forms and student passages for grades 1-10. Teachers can use the free version to manually assess and track individual student reading progress (Don Johnson, n.d.).

Once a student's specific reading accommodations are identified, accessibility and assistive technology teams are tasked with ensuring that students have the appropriate resources and assistive technologies to access instructional materials. Two specific resources that can be used to meet specific identified reading accommodations include Storyline Online (Pre-K through 3rd Grade; n.d.) and Lit2Go (K-12; see attached Day Two Morning PowerPoint-#A11Y_ EC Summer Institute on Accessibility, slide 11; n.d.). Both resources provide grade-level text that can be accessed in print form and audio files. Storyline Online also allows video read-aloud.

SETT FRAMEWORK

When determining appropriate assistive technology, the SETT framework, developed by the late Dr. Joy Zabala (n.d.) is highly recommended. Most teams begin with the main graphic organizer for data gathering tool, which gives the SETT its essential meaning. However, teams should start with the Consideration of AT Needs. The rationale for starting with the consideration tool is to ensure teams are looking at the whole child, for both strengths and needs, in all domains. In addition, the consideration tool looks at existing tasks the students may already be performing and/or reviews the current implementation of interventions. The recommendation is for teams to collaboratively work through the entire SETT framework (Zabala, n.d., SETT Scaffolds) in the following order (see attached Day Two Morning PowerPoint-#A11Y_ EC Summer Institute on Accessibility, slide 12):

1. SETT Scaffold for Consideration of AT Needs.
2. Scaffold for Data Gathering.
3. SETT Scaffold for Tool Selection (downloadable).
4. SETT Scaffold Implementation and Evaluation of the Effectiveness Planning.

A 10-15 minute break was provided after the presentation of this information.

PERSONALIZING AT NEEDS ACTIVITY

After the break, learners were individually engaged in the personalizing at needs activity. Learners were asked to identify a student with accommodations they had previously worked with. They were then tasked with analyzing if the accommodations currently in place for that student are the best options. If the current accommodations were not determined to be the best option, learners were asked to consider additional information or resources that may be needed for the student to acquire, engage, and enjoy the same information as non-disabled peers with equal and equivalent ease. Learners were reminded to refer to the definition established for accessibility on the National AEM Center's What is Accessibility (National Center on AEM, n.d.i) website while completing this activity.

DEEPER DIVE INTO ACCESSIBLE READING RESOURCES

According to the CAST's National Center on AEM (n.d.a), accessible media producers (AMPs) are services that convert materials, including textbooks and related curriculum materials, to one or more student-ready accessible formats. To close out the morning session for Day Two, time was spent exploring various AMPs (see attached Day Two Morning PowerPoint-#A11Y_EC Summer Institute on Accessibility, slides 14-19).

Learners were introduced to three commonly recognized AMPs which included Bookshare (Bookshare A Benetech Initiative, n.d.), Learning Ally (n.d.), and the Louis Database (APH Louis, n.d.). These organizations operate under the Chafee Amendment for copyright laws to provide accessible formats to eligible persons, while they do not all have the same eligibility requirements, they all perform the same task, they convert print and digital materials to accessible materials for student use.

AMERICAN PRINTING HOUSE FOR THE BLIND

The most restrictive based on eligibility for resources is the American Printing House for the Blind (APH; n.d.). To gain free materials through their federal quota program, students must be or function at the definition of legal blindness. An annual registration is held to determine eligible students. However, APH operates the Louis Database (APH Louis, n.d.) for

accessible materials. This database can be accessed by registered users seeking to locate and purchase accessible materials formats. Again, materials purchased through the Quota system are only available for registered students, but if non-registered students require the formats, they are available for direct purchase. The Louis Database is an excellent resource for educators to look for materials in accessible formats across several AMPs at one time. The time for production of materials that are not already available will vary on the format from days to several months.

BOOKSHARE

The next AMP that was explored was Bookshare (Bookshare A Benetech Initiative, n.d.), which is the world's largest online digital library of accessible formats. Currently they offer over 1 million titles. Bookshare is federally funded and originated from IDEA 2004 to provide accessible formats of National Instructional Materials Access Center (NIMAC) files in a timely manner for students. Timely manner is roughly defined as at the same time as non-disabled peers. Bookshare operates under the Chafee Amendment for copyright laws and their eligibility is based on those laws, while there are restrictions only allowing access to NIMAS sourced materials to students served with an IEP. IDEA 2004 established NIMAC to be an online file repository for instructional/educational materials that can be converted by AMPs for student use and acquisition (National Center on AEM, n.d.d). Bookshare offers a variety of formats including audio, braille, large print, and EPUB (an e-book format). Meeting the timely manner requirement for students is most often achieved through pre-planning and having materials available on a student's electronic Bookshare shelf. Requesting materials can take 3-5 days, so pre-planning aids significantly for a timely manner.

LEARNING ALLY

Finally, Learning Ally (n.d.), was introduced. It is a fee-based AMP that offers human read, digital audio, and EPUB formats. Due to Learning Ally offering human read materials, they do not have an agreement with NIMAC to secure NIMAC files for conversion. Learning Ally offers about 80,000 titles and requesting new titles may take 3-6 months for them to be available for students.

LOCAL AMPs

Some Education Agencies employ their own AMPs which can produce local conversion of materials. Local AMPs are certified through NIMAC and are capable to securely download NIMAC sourced files to be converted into the accessible formats for student use. Traditionally, AMPs have mostly been braillists who convert print materials to embossed or electronic braille. However, with the growing need for additional formats and accommodations required for students, additional personnel are becoming AMPs. Information and training materials for becoming an Accessible Media Producer are available directly from the National Instructional Materials Access Center [NIMAC] (n.d.).

In early 2020, before the pandemic hit, North Carolina started the AMPup for Braille to help grow the number of AMPs in the state and to make braille materials more widely available. Internalizing the process allowed the state to make the process more time efficient and effective for local AMPs. This professional learning community of AMPs meets once a month to problem solve and share ideas among the group.

EXPLORATION OF AMPs ACTIVITY

To wrap up the morning session, learners were asked to create a chart to understand eligibility criteria and formats available from the three national AMPs (see attached Day Two Morning PowerPoint-#A11Y_EC Summer Institute on Accessibility, slide 20). They were also asked to identify any local AMPs and their capacities. Learners were given approximately 15 minutes for this activity.

During the morning session, options for assessing individual student needs were explored. A variety of resources were identified and explored that can be used to support individual students in reading. Accessible Media Producers (AMPs) were also defined, and some specific examples of the most common AMPs were demonstrated. After this wrap-up, a lunch break was provided with participants returning for the Day Two Afternoon session.

DAY TWO AFTERNOON

MATERIALS

RESOURCES

- Computer with Internet and Google Drive / Microsoft Office 365 access

HANDOUTS AND PRESENTATIONS

- [Day Two Afternoon PowerPoint #A11Y_EC Summer Institute on Accessibility](#)

WEBSITES AND ARTICLES

- POUR Principles website (W3C Web Accessibility Initiative [WAI], 2019)
- NIMAS in Purchase Orders & Contracts website (National Center on AEM, n.d.e)
- [NIMAC](#) website (NIMAC, n.d.)
- [Personalizing the Reading Experience](#) website (National Center on AEM, n.d.f)
- [Personalizing the Writing Experience](#) webinar webpage (National Center on AEM, 2020b)
- [Teaching with Accessible Math](#) website (National Center on AEM, n.d.h)
- [Computer Science: Writing Math on the Web](#) article (Hayes, 2009)
- MathJax: A Platform for Mathematics on the Web article (Cervone, 2012)
- [Framework for Accessible Specification of Technologies](#) article (W3C, 2021)
- Elementary Algebra 2e textbook-[Lesson 5.1 Solve Systems of Equations by Graphing](#) (Marecek et al., 2023)

AUDIO AND VIDEO

- [Accessibility Features in the Desmos Graphing Calculator](#) (Desmos, 2017)
- [Designing for Accessibility with POUR](#) (National Center on AEM, 2018)
- [Introducing Equatio](#) (Texthelp, 2017)
- [S.02. Episode 01: It's Not Cheating! Myth Busting](#) podcast (National Center on AEM, 2022a)
- [S.02. Episode 04: Procurement as a Collaborative Process](#) podcast (National Center on AEM, 2022b)

SETUP

The Day Two Afternoon session consists primarily of having learners explore a variety of digital resources independently. While there are two interactive activities that were built into the afternoon session, both were designed to be completed independently with the use of internet-connected devices. A lab setting where each participant has access to their own computer is preferred, however, a computer lab setting was not available at the location during the two days the Summer Institute took place.

If an online format is being used, learners could either share their responses for the two interactivities asynchronously through discussion forums built into the learning management system, or video conference rooms could be configured.

INTRODUCTION

Over the course of the first day and a half, accessibility was defined, individual needs and how to assess them were investigated, strategies for building accessible content were identified, and options for creating more accessible reading opportunities were explored. During the final afternoon, the focus shifted to creating more accessible math opportunities and discussing considerations for addressing accessibility during the procurement process.

INSTRUCTIONAL DESIGN STRATEGY: THE POUR PRINCIPLES

The POUR Principles were developed as part of the World Wide Web Consortium's (W3C) Web Accessibility Initiative (W3C WAI, 2019). POUR stands for Perceivable, Operable, Understandable, and Robust. When teachers design materials, they should remember to apply POUR principles. The Designing for Accessibility with POUR video (3:04) by the National Center on AEM (2018) was shown to provide participants a more in-depth introduction to the principles (see attached Day Two Afternoon PowerPoint #A11Y_ EC Summer Institute on Accessibility, slide 3). As participants watched the videos, learners were asked to reflect specifically on how the POUR principles could be integrated into designing accessible math content. Following the

video, a deeper discussion of the POUR Principles occurred that included the following steps:

- *Think about how to make content and materials perceivable to all students based on individual needs from the data collected.*
- *Identify strategies for making content operable to ensure effective navigation. Not all students can use a mouse to navigate, understanding the importance of key commands.*
- *Create understandable content based on student needs. There are a lot of common accessibility features now built into platforms and software to help assist with making content more understandable. The Clusive: Learning that adapts to you (CAST, 2022) resource was also introduced in this section as a potential resource for making content more understandable.*
- *Robust accessibility will help to ensure that there is more compatibility with other devices and content.*

As the importance of the POUR principles was discussed (and the need to make content perceivable, operable, understandable, and robust), so, too, was the need to increase the accessibility of digital mathematical content. Historically, presenting mathematical content in digital formats has been a challenge. Thus, time was spent discussing the historical timeline for developing accessible math content from a non-technical perspective (see attached Day Two Afternoon PowerPoint #A11Y_ EC Summer Institute on Accessibility, slides 4-6).

MATHEMATICS AND ACCESSIBILITY

Presenting mathematical content and other complex scientific notations such as chemical formulas are not something that basic Internet protocols were designed to support (Hayes, 2009). As a result, mathematical content often renders differently from one web-browser to another. One strategy that has been used to address the differences in rendering math on the web has been to insert the expressions, equations, and/or functions as images. However, this strategy brings additional concerns. When talking about images and accessibility, the need for alternative text for images with embedded text has already been explained. Adding alt text for an image has become seamless with most modern technologies. Alternative text would be added to a mathematical expression the same way alt text would be added to any other image. So, if the function $f(x) = 12-x^2$ were added as an image, the alternative text for the image would be written the

same way the function would be read aloud as an IEP accommodation. This would be, “ f of x equals twelve minus x squared.” While that process sounds simple enough, visual impairments occur on a spectrum from low vision all the way through no vision. Low vision individuals can generally access and view text content with the help of assistive technologies like screen magnifiers, built-in zooming features, etc. However, the embedded text on the images becomes distorted as the content is magnified. Therefore, inserting math into digital content as images is not the most efficient, effective, or accessible option.

LATEX

Donal Knuth, who was a professor at Stanford University, became concerned with the deteriorating quality of mathematical representations in the digital world. So, he developed TeX, a formatting language for entire documents including mathematics. Leslie Lamport from Microsoft Research later added to Knuth’s work to form the LaTeX markup language (see attached Day Two Afternoon PowerPoint #A11Y_EC Summer Institute on Accessibility, slide 7; Hayes, 2009). While the LaTeX language fixed rendering issues across multiple browsers, other accessibility issues remained. LaTeX basically presents mathematical content as an image with text that can be magnified without distortion. So, it fixes the assistive technology issue that was previously identified, but it cannot be read by screen readers. As a result, additional work was needed to improve the accessibility of digital math content on the web.

MATHML

MathML, which was endorsed by the World Wide Web Consortium (W3C) in 1998, is the most recent and accessible version of a mathematical markup language that is currently available (see attached Day Two Afternoon PowerPoint #A11Y_EC Summer Institute on Accessibility, slide 8; Hayes, 2009). Unlike LaTeX, MathML does not convert math equations into an image. Instead, it relies on the extensible Markup Language (XML) which is a standard specifically designed to structure documents on the World Wide Web (Achard et al., 2001). Both the NIMAC and Bookshare offer math content in XML files. MathML addresses all the barriers that have been previously identified related to accessibility issues with math. It relies on MathJax, code that is inserted into the headers of websites and learning management

systems causing both MathML and TeX mathematical content to be rendered in MathML for browsers that support it (and HTML and CSS for the browsers where MathML is not supported; Cervone, 2012). As an example, MathML renders properly in the Mozilla Firefox web browser, but Google Chrome does not recognize MathML for security purposes.

Most modern learning management systems like Instructure’s Canvas, have integrated equation editors into their rich content editors to assist educators with creating correctly rendered mathematical content. However, equation editors like those found in Canvas render the math in LaTeX rather than MathML. In recent years, Canvas has configured a way to allow LMS administrators to enable MathJax at the site level to address this issue. A more in-depth exploration of the process for properly coding math was not provided in this session. Instead, the focus was simplistic strategies that can be implemented to create accessible math experiences.

INTRODUCING EQUATIO AND DESMOS

Equatio and Desmos are two mathematical tools that are available for free to help with math and accessibility (see attached Day Two Afternoon PowerPoint #A11Y_EC Summer Institute on Accessibility, slides 9-10). Participants began by watching the Introducing Equatio Texthelp video (Texthelp, 2017) to get a better understanding of what the tool is and how it works. Equatio allows users to take a screenshot of mathematical expressions, even in paused videos like those found on Khan Academy. The tool renders these screenshots into text in MathML format and reads it aloud properly.

Desmos is a free online scientific graphing calculator that can be used to replace the traditional TI-85 calculators. Desmos has been specifically designed to integrate in various ways with multiple screen readers. Participants were shown the Accessibility Features in the Desmos Graphing Calculator (Desmos, 2017) video for a more detailed explanation of the accessibility features that are available through the tool. While talking TI-85 calculators were the traditional go to for braille and screen readers completing higher level math courses, Desmos offers the same features with ease of use and learning. Desmos is the built-in calculator for all NC state supported standardized tests that are deemed calculator active.

EXPERIMENTING WITH DESMOS ACTIVITY

Since Desmos is a free web-based application that does not have to be installed, learners were provided with about 10 minutes to experiment with different aspects of the tool (see attached Day Two Afternoon PowerPoint #A11Y_EC Summer Institute on Accessibility, slide 11). To complete this activity, learners were asked to visit Lesson 5.1 (Solve Systems of Equations by Graphing) in the OpenStax *Elementary Algebra 2e* textbook (Marecek et al., 2023). Lesson 5.1 was chosen because the instructional content explains how systems of equations are graphed and multiple example problems are provided in the lesson. Each practice problem includes a link to show/hide the solutions. By default, all solutions are hidden, which provide learners with the opportunity to attempt to graph each system of equations using Desmos first before checking the accuracy of their graphs.

Learners who had a background in mathematics were asked to partner with other teachers who did not share a similar background. The presenters who had experience in math also worked with learners during this activity. Learners who did not have access to a technology device were also asked to partner with a learner who had a device.

A 10-15 minute break was provided after the presentation of this information and activity.

ACCESSIBILITY AND THE PROCUREMENT PROCESS

There are different ways to access or acquire accessible formats. While larger curriculum programs and products are commercially available through the procurement process, educational materials are not always accessible. As previously mentioned, teacher made materials are not always available in accessible formats for students who require them. After the break, best practices for acquiring materials in accessible formats for students were explored (see attached Day Two Afternoon PowerPoint #A11Y_EC Summer Institute on Accessibility, slides 12-13).

INFORMATION ON ACQUIRING FROM THE AEM CENTER

For larger programs and large curriculum purchases, it is necessary for decision makers to be knowledgeable about accessible materials. When this language is written into purchase agreements and procurements, for both print and digital based materials, student accessibility is greater from the start. Language in these agreements should include clauses to provide accessible materials to the NIMAC. IDEA 2004 established the NIMAC to be an online file repository for instructional/educational materials that can be converted by AMPs for student use and acquisition. When files are readily available in the NIMAC, local or national conversion by AMPs is expedited to ensure a timely manner of acquiring materials for students.

Starting with the procurement process, sample language is available from the AEM Center to share with those in education agencies making purchasing decisions. During this session, the presenters reviewed where to find and share sample contract language using the National AEM Center's NIMAS in Purchase Orders & Contracts website (National Center on AEM, n.d.e).

NORTH CAROLINA'S AEM PLANNING TOOL

The final resource presented was the NC AEM planning tool. The NC AEM planning tool is good to share with all the teachers on a student's team to ensure all accessible formats that are required are being requested in a timely manner. Depending on the AMP, it could take days or even 6+ months to secure the needed format, so pre-planning is essential. The planning tool can be shared electronically with all teachers on a student's schedule at any time, but it is recommended to share 3-6 months prior to a new semester starting. This tool can assist teams with ensuring that all teachers have input in securing accessible formats for the content they are charged with teaching.

After the presentation of this information, a 10-15 minute break was provided prior to the final activity.

FINAL ACTIVITY: DEEPER DIVE INTO READING, WRITING, AND MATH ACCESSIBILITY

At this point in the Summer Institute, a lot of information had been shared with learners, so the decision was made to conclude the final session by giving learners the opportunity to explore some additional resources on personalizing experience in reading, writing, and math (see attached Day Two Afternoon PowerPoint #A11Y_ EC Summer Institute on Accessibility, slide 14). Learners were given the opportunity to pair up, work in small groups, or work independently to explore the following resources on their own (National Center on AEM, n.d.b):

- Personalizing the Reading Experience.
- Personalizing the Writing Experience.
- Teaching with Accessible Math.

During this activity, learners were asked to identify any additional wonders (questions) or wows ('aha' moments) that might not have been covered over the course of the two-day Summer Institute. A brief five-to-ten-minute whole group discussion concluded the session (see attached Day Two Afternoon PowerPoint #A11Y_ EC Summer Institute on Accessibility, slide 15). Some of the questions that participants asked included:

- What are some strategies for getting more buy in for addressing accessibility from administrators and other teachers outside of those who work specifically with exceptional children?
- Where is a good starting point for addressing all the different concepts that were presented throughout the institute?
- What kinds of additional support strategies/resources are available to help educators as they begin to and continue to address accessible material concerns?
- Six participants strongly agreed and 3 agreed that the institute provided them with ideas/strategies to assist in their current roles.
- Eight participants strongly agreed and 1 agreed that the speakers were very engaging and knowledgeable.
- Seven participants strongly agreed and 2 agreed that the institute fulfilled their reason for attending.
- Eight participants strongly agreed and 1 agreed that they would recommend the institute to others.
- Seven participants strongly agreed and 2 agreed that they were highly satisfied with the institute.

version of this lesson would be to have access to both a computer lab setting and a space where participants could move around the room freely.

At the end of both days of the Summer Institute, multiple learners approached the presenters to share their appreciation of the materials and resources that were shared. One comment that was continuously shared was that the material was very valuable, but it was a lot to take in and process in a two-day timeframe. Several participants shared that they would like to have more time to process and test out some of the resources and strategies shared and then come back to have follow-up reflections with a larger group. Participants were reminded that all presentation materials and resources from both days would continue to be available through the Google Shared Drive folder.

An electronic survey was distributed to all participants at the end of each day. A total of 10 participants completed the survey. One participant completed the survey twice. For the participant who completed the survey twice, the first time they completed the survey, all Likert scale items were marked as strongly disagree, however, the second time, all responses were marked as strongly agree. That participant's responses were removed from the following results for a total of nine participants. The questions and responses were:

CRITICAL REFLECTION

The original plan was to host the two-day Summer Institute in a lab setting where all participants had access to their own computer. However, a last-minute change by the UNC-Greensboro staff forced us to move the sessions to a standard classroom where participants sat at tables in groups of four. Ultimately, the most preferred setting for an in-person

Two additional open-ended questions were presented where participants were asked what they found beneficial about the institute and if there were any additional comments. When asked how participants benefited from the institute, participants responded with the following feedback (which has been summarized by the session instructors).

- Throughout the session, the speakers provided valuable information on accessible rules, which was an eye-opener for the learner who had not been following some of them.
- The session offered numerous tips on how to make documents more accessible, particularly for screen reader purposes, and contained outstanding information that could be applied to improve documented accessibility.
- The session included a walkthrough on how to create accessible content, which was useful in learning how to make documents accessible for everyone.
- The content provided will assist the learner in making lessons accessible for everyone and the guided examples were very beneficial.
- Overall, the session was full of good, practical information for creating accessible content.

When participants were given the opportunity to share other comments about the session, one learner expressed their appreciation for the shared information and indicated a willingness to share it with others. Another learner stated that they are looking forward to the next session and found the information built nicely on content from the previous class. A third learner praised the instructors for their knowledge and ability to create a comfortable learning environment.

The biggest reflection that came out of the session was how this conversation and information can be moved beyond just Exceptional Children’s (EC) teachers to get buy-in from regular education teachers, content designers, administrators, and district-level personnel. While those who attended the two-day Summer Institute embrace and work with students who require these services daily, it has become a common viewpoint among educators outside of EC that accessibility is mainly an EC issue. We offered to work with learners who attended the session to meet with their district personnel, building administrators, and regular education teachers to present this same information on a local level.

One thing that was missing from the two-day Summer Institute was the opportunity for learners to bring in content from their own schools and classrooms to assess it for accessibility concerns and to receive feedback on addressing those concerns. To make this happen, a third day would be needed. However, that was not possible at the time of the implementation of this lesson. In the future, our thoughts are to reach out to participants ahead of

time and have them bring some of their own instructional digital content with them to the Summer Institute, so those examples can be integrated into the sessions that were presented. If this new process were implemented, some of the activities where learners explore resources could be replaced with opportunities to analyze and adjust their own content.

Finally, the instructors are in the process of converting the materials presented during the Summer Institute into a Canvas course which will provide both synchronous and asynchronous instructional opportunities. The hope is to have the final version of the Canvas course completed prior to the 2023 Summer Institute.

REFERENCES

- Accessibility Works. (2023, January 2). *2023 ADA web accessibility standards & requirements*. <https://www.accessibility.works/blog/2023-wcag-ada-website-compliance-standards-requirements/>
- Achard, F., Vaysseix, G., & Barillot, E. (2001). XML, bioinformatics and data integration. *Bioinformatics*, 17(2), 115-125. <https://doi.org/10.1093/bioinformatics/17.2.115>
- American Printing House. (n.d.). *Breaking down barriers*. Retrieved June 5, 2023, from <https://www.aph.org/>
- APH Louis. (n.d.). Retrieved June 5, 2023, from <https://louis.aph.org/#/>
- Assistive Technology Industry Association. (n.d.). *AT Resources*. Retrieved June 5, 2023, from <https://www.atia.org/home/at-resources/what-is-at/>
- ATWare Solutions LLC. (2021, November 19). *AIM Explorer*. Google Play. https://play.google.com/store/apps/details?id=com.kihdapps.aimexplorer&hl=en_US&gl=US&pli=1
- Baran, E., & Alzoubi, D. (2020). Human-centered design as a frame for transition to remote teaching during the COVID-19 pandemic. *Journal of Technology and Teacher Education*, 28(2), 365-372. <https://www.learntechlib.org/primary/p/216077/>

- Bookshare A Benetech Initiative. (n.d.). *Bookshare Reader is Here*. https://www.bookshare.org/cms/?gclid=CjwKCAiA8OmdBhAgEiwAShr400uR4AhJi uKzOYagJx82OsQfsmRLQg223OX-SsOdjj_7nisWHss-BRoCymEQAvD_BwE
- CAST. (2022, June 13). *Clusive: Learning that adapts to you* [Video]. YouTube. <https://youtu.be/0vauZJBWhXs>
- Center for Applied Special Technology. (2018). *Universal design for learning guidelines version 2.2* [Graphic organizer]. <https://udlguidelines.cast.org/>
- Cervone, D. (2012, February). MathJax: A platform for mathematics on the web. *Notices of the AMS*, 59(2), 312-316. <http://dx.doi.org/10.1090/noti794>
- Desmos. (2017, February 16). *Accessibility features in the Desmos graphing calculator* [Video]. YouTube. <https://www.youtube.com/watch?v=EqqiqTkThi8>
- Don Johnson (n.d.). *UPAR help students access grade-level text*. Retrieved June 5, 2023, from <https://learningtools.donjohnston.com/product/upar/>
- Goldman, M., & Goldman, S. (1988). Reading with closed-captioned TV. *Journal Of Reading*, 31(5), 458-461. <https://www.jstor.org/stable/40029882>
- Gusta, W., Christina, D., & Zakirman, Z. (2020). Improved student collaboration skills on English learning using jigsaw models. *International Journal of Scientific & Technology Research*, 9(3), 1051-1056. <https://www.ijstr.org/paper-references.php?ref=IJSTR-0320-33029>
- Hayes, B. (2009). Computer science: Writing math on the web. *American Scientist*, 97(2), 98-102. <https://www.jstor.org/stable/27859291>
- Horton, S., & Quesenbery, W. (2014). *A web for everyone: Designing accessible user experiences*. Rosenfeld Media.
- LearningAlly. (n.d.). *About us*. Retrieved June 5, 2023, from https://learningally.org/About-Us/Join?gad=1&gclid=CjwKCAjwov6hBhBsEiwAvrvN6JbvE4chm7yzQW07JfUTeiZtIOCTMtpf-RWrTkv5sOExaB14xED2vxOCbsYQAvD_BwE
- Lhamon, C. E. (2023). *OCR fiscal year 2022 annual report*. U.S. Department of Education Office of Civil Rights. Retrieved June 10, 2023 from <https://www2.ed.gov/about/reports/annual/ocr/report-to-president-and-secretary-of-education-2022.pdf>
- Lit2Go. (n.d.). *Books*. Retrieved June 5, 2023, from <https://etc.usf.edu/lit2go/books/>
- Marecek, L., Anthony-Smith, M., & Mathis, A. H. (2023). *Elementary Algebra 2e textbook*. OpenStax. <https://openstax.org/details/books/elementary-algebra-2e>
- Mason, A. M., Compton, J., & Bhati, S. (2021). Disabilities and the digital divide: Assessing web accessibility, readability, and mobility of popular health websites. *Journal of Health Communication*, 26(10), 667-674. <https://doi.org/10.1080/10810730.2021.1987591>
- Microsoft. (n.d.). *Make slides easier to read by using the Reading Order pane*. Retrieved June 5, 2023, from <https://support.microsoft.com/en-us/office/make-slides-easier-to-read-by-using-the-reading-order-pane-863b5c1c-4f19-45ec-96e6-93a6457f5e1c#:~:text=Check%20the%20reading%20order%20of,section%20to%20open%20the%20list>
- Morris, K. K., Frechette, C., Dukes, L., Stowell, N., Topping, N., Emert, N. & Brodosi, D. (2016). Closed captioning matters: Examining the value of closed captions for "All" students. *Journal of Postsecondary Education and Disability*, 29(3), 231-238. <https://eric.ed.gov/?id=EJ1123786>
- MSFTEnable. (2021, September 11). *Assistive technology* [Video]. YouTube. <https://www.youtube.com/watch?v=DBxmADjOll4>
- National Center on Accessible Education Materials. (n.d.a). *Acquiring accessible formats*. Retrieved June 5, 2023, from <https://aem.cast.org/acquire/acquiring-accessible-formats#amp>
- National Center on Accessible Education Materials. (n.d.b). *Decision-making & accessible formats*. Retrieved June 5, 2023, from <https://aem.cast.org/acquire/decision-making-accessible-formats>

- National Center on Accessible Education Materials. (n.d.c). *Determining a learner's need*. Retrieved June 5, 2023, from <https://aem.cast.org/acquire/determining-need-accessible-formats>
- National Center on Accessible Education Materials. (n.d.d). *NIMAS and NIMAC*. Retrieved June 5, 2023, from <https://aem.cast.org/nimas-NIMAC/nimas-NIMAC>
- National Center on Accessible Education Materials. (n.d.e). *NIMAS in purchase orders & contracts*. Retrieved June 5, 2023, from <https://aem.cast.org/nimas-nimac/nimas-purchase-orders-contracts>
- National Center on Accessible Education Materials. (n.d.f). *Personalizing the reading experience*. Retrieved June 5, 2023, from <https://aem.cast.org/use/personalizing-reading>
- National Center on Accessible Education Materials. (n.d.g). *Quality indicators for the provision of accessible educational materials & technologies*. Retrieved June 5, 2023, from <https://aem.cast.org/coordinate/quality-indicators-provision-accessible-materials-technologies>
- National Center on Accessible Education Materials. (n.d.h). *Teaching with accessible materials*. Retrieved June 5, 2023, from <https://aem.cast.org/use/teaching-accessible-math>
- National Center on Accessible Education Materials. (n.d.i). *What is accessibility?* Retrieved June 5, 2023, from <https://aem.cast.org/get-started/defining-accessibility>
- National Center on Accessible Education Materials. (2018). *Designing for accessibility with POUR* [Video]. YouTube. <https://youtu.be/dzzlJQXmJlw>
- National Center on Accessible Education Materials. (2020a). *AEM Quality Indicators with critical components for K-12*. <https://aem.cast.org/binaries/content/assets/common/publications/aem/k12-aem-qualityindicators-criticalcomponents.pdf>
- National Center on Accessible Education Materials. (2020b, June 15). *Personalizing the writing experience*. <https://aem.cast.org/get-started/events/2020/06/personalizing-writing-experience>
- National Center on Accessible Education Materials. (2021). *AEM Navigator*. <https://aem.cast.org/get-started/resources/2021/aem-navigator>
- National Center on Accessible Education Materials. (2022a). *S.02, Ep.01: It's not cheating! Myth busting* [Podcast]. <https://aem.cast.org/get-started/resources/accessible-learning-experience/s02-ep01-its-not-cheating-myth-busting-suding>
- National Center on Accessible Education Materials. (2022b). *S.02, Ep.04: Procurement as a collaborative process* [Podcast]. <https://aem.cast.org/get-started/resources/accessible-learning-experience/s02-ep04-procurement-collaborative-process>
- National Center on Accessible Education Materials. (2022c, April 8). *Start a conversation: Accessible learning across the lifespan* [Video]. YouTube. <https://youtu.be/k9Xr-S8jk>
- National Instructional Materials Access Center. (n.d.). *Accessible media producers*. Retrieved June 5, 2023, from <https://www.NIMAC.us/accessible-media-producers/>
- Pacercenter. (2012, September 28). *Assistive technology in action: Meet Elle* [Video]. YouTube. <https://www.youtube.com/watch?v=g95T020hmo>
- Reading Rockets. (n.d.). Retrieved June 6, 2023, from <https://www.readingrockets.org/>
- Smith, C. (n.d.). *Course development training- Accessibility*. Retrieved June 5, 2023, from <https://rise.articulate.com/share/NmU2ZfTN-c32KAm8j8bez8m28z0b6CLv#/>
- Storyline Online. (n.d.). Retrieved June 5, 2023, from <https://storylineonline.net/>
- TED. (2022, February 19). *Jane Velkovski: The life-changing power of assistive technologies* [Video]. YouTube. <https://www.youtube.com/watch?v=ltGGGN4jeYE>

- Texthelp. (2017, October 6). *Introducing Equatio* [Video]. YouTube. <https://www.youtube.com/watch?v=BWmPQ7mcKrM>
- The Cheesecake Factory. (n.d.). *Our menu*. Retrieved June 5, 2023, from <https://www.thecheesecakefactory.com/menu>
- The Disability Law Center of Virginia. (2021, March 4). *Assistive technology devices in action for people with disabilities* [Video]. YouTube. <https://www.youtube.com/watch?v=iyQITEACATk>
- U.S. Department of Education. (2013, February 28). *Resolution agreement: South Carolina technical college system OCR compliance review No. 11-11-6002*. <https://www2.ed.gov/about/offices/list/ocr/docs/investigations/11116002-b.html>
- W3C. (2021, November 4). *Framework for accessible specification of technologies (FAST)*. <https://w3c.github.io/apa/fast/>
- W3C Web Accessibility Initiative (WAI). (2019, May 10). *Accessibility principles*. <https://www.w3.org/WAI/fundamentals/accessibility-principles/>
- Zabala, J. (n.d.). *Resources / SETT downloads*. Retrieved June 5, 2023, from <https://www.joyzabala.com/links-resources>
- Zabala, J. S. (2020). The SETT framework: A model for selection and use of assistive technology tools and more. *Assistive Technology to Support Inclusive Education*, 14, 17-36. <https://doi.org/10.1108/S1479-363620200000014005>
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