



California Open Online Library for Education & Accessibility

COOL4Ed (the California Open Online Library for Education) was created so that faculty can easily find, adopt, utilize, review and/or modify free and open etextbooks for little or no cost. The COOL4Ed accessibility open textbook evaluations can inform faculty, staff, and students how the free and open etextbooks meet 15 accessibility “checkpoints” that could impact the learning of learners with a range of disabilities.

SUMMARY OF ACCESSIBILITY EVALUATION:

Textbook: Calculus
Format of Textbook: PDF

Assistive Technology (AT) Evaluation Score: Overall	4.5 (Maximum score = 10)
<p>Assistive Technologies (AT) Evaluations applies specialized tools and software in the accessibility evaluation process. These specialized assistive technologies, see list below, are typically not used or available by the general public into the accessibility evaluation process.</p> <ul style="list-style-type: none"> • Accessibility features of desktop operating systems (e.g. high-contrast display themes, settings from the Keyboard and Mouse control panels) • Accessibility-related software included with desktop operating systems (e.g. VoiceOver, Microsoft Narrator) • Third-party accessibility software and hardware: • Screen readers (e.g. JAWS, Window Eyes) • Magnification software (e.g. ZoomText Magnifier/Reader, MAGIC Pro with Speech) • Reading software for users with learning disabilities (e.g. Read and Write Gold, Kurzweil 3000) • Refreshable Braille displays 	
Non- Assistive Technology (NAT) Evaluation Score: Overall	5.3 (Maximum score =10)
<p>Non-Assistive Technologies (NAT) Evaluations applies only native or basic tools and software such as the keyboard and Narrator in the accessibility evaluation process. These non-assistive technologies are readily available and used by the general public.</p>	



COOL4Ed Accessibility Evaluation Methods:

The California State University [Accessible Technology Initiative](#) and [MERLOT](#) (Multimedia Educational Resources for Learning and Online Teaching) developed the rubric or “checkpoints” for the accessibility evaluation. [CAST](#), a nationally recognized organization with expertise in accessibility and UDL, reviewed and affirmed the appropriateness and value of the accessibility evaluation rubric and contributed the references and support resources to help people learn how best to design, evaluate, and remediate the learning materials to maximize the accessibility of the learning resources for all. The “checkpoints” have been built upon the Section 508 technical standards and has been organized and tailored to the typical characteristics of digital resources used in higher education courses.

The accessibility evaluations were performed by the [Center for Usability in Design and Accessibility](#) at California State University, Long Beach; faculty and graduate students with expertise in human factors, usability, and accessibility performed the evaluations of over 150 free and open etextbooks. COOL4ed.org has published the accessibility evaluation rubric and provides a detailed description of the methodology used to evaluate the accessibility of the etextbooks in COOL4ed.

LOOKING FOR DETAILED ACCESSIBILITY REPORTS?

[See Detailed Accessibility Evaluation Report using Assistive Technologies](#)

[See Detailed Accessibility Evaluation Report using Non-Assistive Technologies](#)



DETAILED ACCESSIBILITY EVALUATION REPORT using Assistive Technologies

Assistive Technologies (AT) Evaluations applies specialized tools and software in the accessibility evaluation process. These specialized assistive technologies, such as Kurzweil and NVDA, are typically not used or available by the general public into the accessibility evaluation process.

1. Accessibility Documentation

A. The organization providing the online materials has a formal accessibility policy.	Fail
Additional Information:	Did not find any information about MITOpenCourseware's formal accessibility policy.
B. The organization providing the online materials has an accessibility statement.	Fail
Additional Information:	Did not find any information about MITOpenCourseware's accessibility statement.
C. An Accessibility Evaluation Report is available from an external organization.	Fail
Additional Information:	Did not find any information about MITOpenCourseware's accessibility evaluation report.

2. Text Access

A. The text of the digital resource is available to assistive technology that allows the user to enable text-to-speech (TTS) functionality.	Fail
Additional Information:	1/5 pages had text that was properly read aloud (Ch. 4). The remaining four pages were not read properly (Ch. 1, 5, 10, 16). In chapter 1, there were 2 pages that were "empty pages." In chapter 5, 10, and 16, the NVDA reader kept skipping around the textbook and would go back to previous pages while being read aloud.



3. Text Adjustment

A. Text is compatible with assistive technology.	Pass
Additional Information:	5/5 pages were able to adjust in size (Ch. 1, 4, 5, 10, 16). However, in order to read the content, the textbook had to be scrolled horizontally.
B. The resource allows the user to adjust the font size and font/background color (or is rendered by an application such as a browser, media player, or reader) that offers this functionality).	Fail
Additional Information:	0/5 pages were able to properly adjust font and background colors (Ch. 1, 4, 5, 10, 16). None of the pages changed font or background colors.

4. Reading Layout

A. Text of the digital resource is compatible with assistive technology that allows the user to reflow the text by specifying the margins and line spacing (or is rendered by an application such as a browser, media player, or reader that offers this functionality).	Pass
Additional Information:	5/5 pages had proper reflow of text because the text did not adjust, the layout remained the same (Ch. 1, 4, 5, 10, 16).
B. If the digital resource is an electronic alternative to printed materials, the page numbers correspond to the printed material.	N/A
Additional Information:	No printed material available.

5. Reading Order

A. The reading order for digital resource content logically corresponds to the visual layout of the page when rendered by assistive technology.	Fail
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Additional Information:	1/5 pages had text that was properly read aloud (Ch. 4). The remaining four pages were not read properly (Ch. 1, 5, 10, 16). In chapter 1, there were 2 pages that were "empty pages." In chapter 5, 10, and 16, the NVDA reader kept skipping around the textbook and would go back to previous pages while being read aloud.
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6. Structural Markup/Navigation

A. The text of the digital resource includes markup (e.g. tags or styles) that allows for navigation by key structural elements (chapters, headings, pages) using assistive technology (or is rendered by an application such as a browser, media player, or reader that offers this functionality).	Fail
Additional Information:	0/33 pages had text that was properly navigable using the NVDA reader hotkeys (Ch. 1(20), 4(10), 7(10), 10(10), 13(10), 16(10)). Headers, lists, and tables were not found.
B. The text of the digital resource includes markup for bullets and numbered lists that is compatible with assistive technology (or is rendered by an application such as a browser, media player, or reader that offers this functionality).	Fail
Additional Information:	0/10 lists were properly found by the NVDA reader (Ch. 1(5), 4, 7, 10, 13, 16). Lists were not found and the NVDA reader would read lists that were not present.
C. If the text of the digital resource is delivered within an ebook reader application, a method is provided that allows users to bypass the reader interface and move directly to the text content that is compatible with assistive technology.	N/A
Additional Information:	Not using eReader application.



7. Tables

<p>A. Data tables include markup (e.g. tags or styles) that identifies row and column headers in a manner that is compatible with assistive technology (or are rendered by an application such as a browser, media player, or reader that offers this functionality).</p>	<p>N/A</p>
<p>Additional Information:</p>	<p>No tables were found, but the NVDA reader would read tables that were not present. In each chapter, the chapters were written as a table and the NVDA reader would read the content as if it were in a table.</p>

8. Hyperlinks

<p>A. In-book links take you to a location within the textbook. For example, the table of contents would be considered in-book links and embedded links take you to the correct location in the book.</p>	<p>Pass</p>
<p>Additional Information:</p>	<p>30/30 hyperlinks properly link readers to proper places within the textbook (Pg. 50(8), 98(9), 162(4), 361(5), 380(4)).</p>
<p>B. Live hyperlinks take you to any website or webpages external to the book.</p>	<p>N/A</p>
<p>Additional Information:</p>	<p>No live hyperlinks found.</p>
<p>C. Live links take you to the correct webpage that is functioning properly.</p>	<p>N/A</p>
<p>Additional Information:</p>	<p>No live hyperlinks found.</p>
<p>D. Live links are descriptive enough for the users to know where it should take them.</p>	<p>N/A</p>
<p>Additional Information:</p>	<p>No live hyperlinks found.</p>

9. Color and Contrast

<p>A. All information within the material that is conveyed using color is also available in a manner that is compatible with those that do</p>	<p>Pass</p>
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not perceive color, and information conveyed by color is also conveyed in other ways.	
Additional Information:	33/33 pages had consistent color redundancy (Ch. 1(13), 10(10), 16(10)). Headers and text were consistently black against a white background.
B. Information is conveyed from the sub-categories for contrast.	Pass
Additional Information:	33/33 pages had headers with proper color contrast (Ch. 1(13), 10(10), 16(10)). Headers were black against a white background. 33/33 pages had text that had proper color contrast (Ch. 1(13), 10(10), 16(10)). Text was black against a white background. 33/33 pages had text that had proper color contrast (Ch. 1(13), 10(10), 16(10)). Text was black against a white background. 33/33 pages had simple images with proper color contrast (Ch. 1(13), 10(10), 16(10)). Simple images were black against a white background.
C. Contrast for headers passed WCAG AA standards for large texts (contrast ratio 3:1).	Pass
Additional Information:	33/33 pages had headers with proper color contrast (Ch. 1(13), 10(10), 16(10)). Headers were black against a white background.
D. Contrast for text passed WCAG AA standards for normal texts (contrast ratio of 4.5:1).	Pass
Additional Information:	33/33 pages had text that had proper color contrast (Ch. 1(13), 10(10), 16(10)). Text was black against a white background.
E. Contrast for simple images (for example, images of atoms) passed WCAG AA standards (contrast ratio of 4.5:1).	Pass
Additional Information:	33/33 pages had simple images with proper color contrast (Ch. 1(13), 10(10), 16(10)). Simple images were black against a white background.



10. Language

<p>A. The text of the digital resource includes markup that declares the language of the content in a manner that is compatible with assistive technology.</p>	<p>N/A</p>
<p>Additional Information:</p>	<p>Do not have the Adobe Pro/Complete version.</p>
<p>B. If the digital resource includes passages in a foreign language, these passages include markup that declares the language in a manner that is compatible with assistive technology.</p>	<p>N/A</p>
<p>Additional Information:</p>	<p>Do not have the Adobe Pro/Complete version.</p>

11. Images

<p>A. Non-decorative images have alternative text that is compatible with assistive technology (or is rendered by an application such as a browser, media player, or reader that offers this functionality).</p>	<p>Fail</p>
<p>Additional Information:</p>	<p>0/67 non-decorative images were properly described by the NVDA reader (Ch. 1(20), 4(10), 7(10), 10(10), 13(10), 16(10)). Images were skipped, while the captions were read aloud by the NVDA reader. However, the captions were not enough information to describe what was in the images.</p>
<p>B. Decorative images are marked with null alternate text or contain markup that allows them to be ignored by assistive technology.</p>	<p>N/A</p>
<p>Additional Information:</p>	<p>No decorative images found.</p>
<p>C. Complex images, charts, and graphs have longer text descriptions that are compatible with assistive technology (or are rendered by an application such as a browser, media player, or reader) that offers this functionality).</p>	<p>Fail</p>



Additional Information:	0/67 complex images were properly described by the NVDA reader (Ch. 1(20), 4(10), 7(10), 10(10), 13(10), 16(10)). Images were skipped, while the captions were read aloud by the NVDA reader. However, the captions were not enough information to describe what was in the images.
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12. Multimedia

A. A synchronized text track (e.g. open or closed captions) is provided with all video content.	N/A
Additional Information:	No multimedia content found.
B. A transcript is provided with all audio content.	N/A
Additional Information:	No multimedia content found.
C. Audio/video content is delivered via a media player that is compatible with assistive technology. This includes support for all criteria listed in Section 15 below.	N/A
Additional Information:	No multimedia content found.

13. Flickering

A. The digital resource content does not contain anything that flashes more than three times in any one-second period.	Pass
Additional Information:	No flickering content.

14. Science, Technology, Engineering, and Math (STEM)

A. STEM figures have appropriate markup that indicates that the image is a figure.	Pass
Additional Information:	10/10 figures were properly marked up as figures (Ch. 1(4), 4, 5, 8, 12, 14, 16).
B. STEM graphs have appropriate markup that indicates that the image is a graph.	Fail



Additional Information:	0/10 graphs were properly marked up as graphs (Ch. 1(4), 4, 5, 8, 12, 14, 16). Instead of being marked as graphs, the graphs were marked as figures.
C. STEM equations have appropriate markup that indicates that the image is an equation.	Pass
Additional Information:	10/10 equations were properly marked up as figures (Ch. 1(5), 4(4), 5). None of the equations were blacked out.
D. STEM tables have appropriate markup that indicates the image is a table.	N/A
Additional Information:	No tables found.
E. STEM figures have appropriate notation markup that conveys both the notation (presentation) and meaning (semantics) of the STEM content.	Fail
Additional Information:	0/10 figures had proper markup notation (Ch. 1(4), 4, 5, 8, 12, 14, 16). The figures were skipped, while the captions were read aloud. The captions were not enough information to describe what the figures contained.
F. STEM graphs have appropriate notation markup that conveys both the notation (presentation) and meaning (semantics) of the STEM content.	Fail
Additional Information:	0/10 graphs had proper notation markup (Ch. 1(4), 4, 5, 8, 12, 14, 16). Graphs were skipped, while the NVDA reader read the captions. The captions were not enough information to describe what the graph contained.
G. STEM equations have appropriate notation markup that conveys both the notation (presentation) and meaning (semantics) of the STEM content.	Fail
Additional Information:	2/10 equations were properly read aloud by the NVDA reader (Ch. 1(2)). The remaining eight



	equations were either skipped or not read aloud properly (Ch. 2(3), 4(4), 5).
H. Assistive technology used can access the content from the STEM tables.	N/A
Additional Information:	No tables found.

15. Interactive Elements

A. Each interactive element (e.g. menu, hyperlink, button) and function (e.g. annotations) allows keyboard-only operation both with and without assistive technology.	N/A
Additional Information:	No interactive elements found.
B. Each interactive element conveys information to assistive technology regarding the element's name, type, and status (e.g. "Play, button, selected").	N/A
Additional Information:	No interactive elements found.
C. All instructions, prompts, and error messages necessary to complete forms are conveyed as text to assistive technology (or are rendered by an application such as a browser, media player, or reader that offers this functionality).	N/A
Additional Information:	No interactive elements found.



DETAILED ACCESSIBILITY EVALUATION REPORT using Non-Assistive Technologies

Non-Assistive Technologies (NAT) Evaluations applies only native or basic tools and software such as the keyboard and Narrator in the accessibility evaluation process. These non-assistive technologies are readily available and used by the general public.

1. Accessibility Documentation

A. The organization providing the online materials has a formal accessibility policy.	Fail
Additional Information:	No content found.
B. The organization providing the online materials has an accessibility statement.	Fail
Additional Information:	No content found.
C. An Accessibility Evaluation Report is available from an external organization.	Fail
Additional Information:	No content found.

2. Text Access

A. The text of the digital resource is available to assistive technology that allows the user to enable text-to-speech (TTS) functionality.	Fail
Additional Information:	Pgs 80-90 were checked. The text is inconsistently available to be used by assistive technology. Some pages have the ability to be read while other don't. (see pgs 80, 81, 82 for bad examples and pgs 83, 84 for good examples). Additionally, some characters in equations are not read properly.

3. Text Adjustment

A. Text is compatible with assistive technology.	Fail
Additional Information:	Pgs 80-90 were checked. Text does not reflow with size adjustment.



<p>B. The resource allows the user to adjust the font size and font/background color (or is rendered by an application such as a browser, media player, or reader) that offers this functionality).</p>	<p>Fail</p>
<p>Additional Information:</p>	<p>Pgs 80-90 were checked. The document does not support adjustment of document colors.</p>

4. Reading Layout

<p>A. Text of the digital resource is compatible with assistive technology that allows the user to reflow the text by specifying the margins and line spacing (or is rendered by an application such as a browser, media player, or reader that offers this functionality).</p>	<p>Fail</p>
<p>Additional Information:</p>	<p>Pgs 80-90 were checked. Text does not reflow with zoom.</p>
<p>B. If the digital resource is an electronic alternative to printed materials, the page numbers correspond to the printed material.</p>	<p>N/A</p>
<p>Additional Information:</p>	<p>Need additional information. We do not have printed material to compare it too.</p>

5. Reading Order

<p>A. The reading order for digital resource content logically corresponds to the visual layout of the page when rendered by assistive technology.</p>	<p>Pass</p>
<p>Additional Information:</p>	<p>Pgs 80-90 were checked. For the pages that did include the text, paragraphs were read in a logical fashion.</p>

6. Structural Markup/Navigation

<p>A. The text of the digital resource includes markup (e.g. tags or styles) that allows for</p>	<p>Fail</p>
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<p>navigation by key structural elements (chapters, headings, pages) using assistive technology (or is rendered by an application such as a browser, media player, or reader that offers this functionality).</p>	
<p>Additional Information:</p>	<p>No method provided that allows user to bypass sections of text. The tagged PDF and Bookmarks passed. Title and Headings failed using the accessibility checker.</p>
<p>B. The text of the digital resource includes markup for bullets and numbered lists that is compatible with assistive technology (or is rendered by an application such as a browser, media player, or reader that offers this functionality).</p>	<p>Fail</p>
<p>Additional Information:</p>	<p>The tagged PDF and Bookmarks passed. Title and Headings failed using the accessibility checker.</p>
<p>C. If the text of the digital resource is delivered within an ebook reader application, a method is provided that allows users to bypass the reader interface and move directly to the text content that is compatible with assistive technology.</p>	<p>N/A</p>
<p>Additional Information:</p>	<p>No additional eReader used</p>

7. Tables

<p>A. Data tables include markup (e.g. tags or styles) that identifies row and column headers in a manner that is compatible with assistive technology (or are rendered by an application such as a browser, media player, or reader that offers this functionality).</p>	<p>Fail</p>
<p>Additional Information:</p>	<p>Using the accessibility checker the rows and TH and TD passed but headers and regularity failed. Manual check did not find any tables.</p>



8. Hyperlinks

A. In-book links take you to a location within the textbook. For example, the table of contents would be considered in-book links and embedded links take you to the correct location in the book.	Pass
Additional Information:	Within book links in the Table of Contents work and Navigation Links passed the Accessibility Check.
B. Live hyperlinks take you to any website or webpages external to the book.	Pass
Additional Information:	There were no live links.
C. Live links take you to the correct webpage that is functioning properly.	Pass
Additional Information:	There were no live links.
D. Live links are descriptive enough for the users to know where it should take them.	Fail
Additional Information:	There were no live links.

9. Color and Contrast

A. All information within the material that is conveyed using color is also available in a manner that is compatible with those that do not perceive color, and information conveyed by color is also conveyed in other ways.	Pass
Additional Information:	Pgs 400-500 were checked. Different font sizes and types were used. Chapter headings were larger when compared to subheadings. Body paragraph text was smallest overall, with italics and bold used to emphasize. However, within book links cannot be identified by something other than color.
B. Information is conveyed from the sub-categories for contrast.	Pass
Additional Information:	Overall score



C. Contrast for headers passed WCAG AA standards for large texts (contrast ratio 3:1).	Pass
Additional Information:	Pgs 100-150 were checked. Large chapter headings passed with a ratio of 21.0:1.
D. Contrast for text passed WCAG AA standards for normal texts (contrast ratio of 4.5:1).	Pass
Additional Information:	Pgs 100-150 were checked. Text passed with a ratio of 21.0:1.
E. Contrast for simple images (for example, images of atoms) passed WCAG AA standards (contrast ratio of 4.5:1).	Pass
Additional Information:	Pgs 100-150 were checked. Images passed with a ratio of 21.0:1.

10. Language

A. The text of the digital resource includes markup that declares the language of the content in a manner that is compatible with assistive technology.	Pass
Additional Information:	Using the accessibility checker the primary language passed.
B. If the digital resource includes passages in a foreign language, these passages include markup that declares the language in a manner that is compatible with assistive technology.	N/A
Additional Information:	

11. Images

A. Non-decorative images have alternative text that is compatible with assistive technology (or is rendered by an application such as a browser, media player, or reader that offers this functionality).	Fail
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Additional Information:	Pgs 10-20 were checked. The text offered descriptions but they were included in the paragraph text, not directly below the image. Accessibility Checker failed figures and alternate text.
B. Decorative images are marked with null alternate text or contain markup that allows them to be ignored by assistive technology.	N/A
Additional Information:	No content found.
C. Complex images, charts, and graphs have longer text descriptions that are compatible with assistive technology (or are rendered by an application such as a browser, media player, or reader) that offers this functionality).	Fail
Additional Information:	There are no complex images. However, the graphs are quite complex and do not have a description as to what they mean. Accessibility Checker failed figures and alternate text.

12. Multimedia

A. A synchronized text track (e.g. open or closed captions) is provided with all video content.	N/A
Additional Information:	No content found.
B. A transcript is provided with all audio content.	N/A
Additional Information:	No content found.
C. Audio/video content is delivered via a media player that is compatible with assistive technology. This includes support for all criteria listed in Section 15 below.	N/A
Additional Information:	No content found.



13. Flickering

A. The digital resource content does not contain anything that flashes more than three times in any one-second period.	Pass
Additional Information:	Pgs 30-40 were checked. No flickering content was observed. Using the accessibility checker, screen flicker passed.

14. Science, Technology, Engineering, and Math (STEM)

A. STEM figures have appropriate markup that indicates that the image is a figure.	Fail
Additional Information:	0/10 were appropriately marked up (see pgs 10-25). Overall, figures failed to have appropriate markup. There are short descriptions under each image but not descriptive enough to give a hollistic understanding of what is actually occurring in the image. The image itself has labels which are not read by Read Out Loud. However, surrounding paragraphs are detailed and provide enough information about the image content.
B. STEM graphs have appropriate markup that indicates that the image is a graph.	Fail
Additional Information:	0/10 were properly marked up (see pgs 100-115). Overall graphs were not properly marked up to be read logically or could not be read at all.
C. STEM equations have appropriate markup that indicates that the image is an equation.	Fail
Additional Information:	When they could be read, equations were were not properly marked up. (see pg 107, 108, 109, 110). Some characters in the equations could not be read by Read Out Loud function.
D. STEM tables have appropriate markup that indicates the image is a table.	N/A
Additional Information:	No tables were found.
E. STEM figures have appropriate notation markup that conveys both the notation	Fail



(presentation) and meaning (semantics) of the STEM content.	
Additional Information:	10/10 were had appropriate notation (see pgs 400-430). Figures were denoted by a Figures tag, however description within that tag was not sufficient to describe the figure. Surrounding paragraphs are detailed and provide enough information about the image content.
F. STEM graphs have appropriate notation markup that conveys both the notation (presentation) and meaning (semantics) of the STEM content.	Fail
Additional Information:	10/10 had appropriate notation (see pgs 400-430). However, there was not enough information in the description. Information was found in the paragraphs around the graph.
G. STEM equations have appropriate notation markup that conveys both the notation (presentation) and meaning (semantics) of the STEM content.	Fail
Additional Information:	Equations did not have proper notation. (see pg 100-130).
H. Assistive technology used can access the content from the STEM tables.	Pass
Additional Information:	No tables were found.

15. Interactive Elements

A. Each interactive element (e.g. menu, hyperlink, button) and function (e.g. annotations) allows keyboard-only operation both with and without assistive technology.	N/A
Additional Information:	No Interactive Elements Present.
B. Each interactive element conveys information to assistive technology regarding the	N/A



element's name, type, and status (e.g. "Play, button, selected").	
Additional Information:	No Interactive Elements Present.
C. All instructions, prompts, and error messages necessary to complete forms are conveyed as text to assistive technology (or are rendered by an application such as a browser, media player, or reader that offers this functionality).	N/A
Additional Information:	No Interactive Elements Present.

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