



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: Concepts of Biology (OpenStax)

Format of Textbook: PDF

Assistive Technology (AT) Evaluation Score: Overall	6.1 (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	6.4 (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:	Could not find this information.
B. The organization providing the online materials has an accessibility statement.	Fail
Additional Information:	Could not find this information.
C. An Accessibility Evaluation Report is available from an external organization.	Fail
Additional Information:	Could not find this information.

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.	Pass
Additional Information:	NVDA read all the text on pages 11-15. However, the pace was very fast and sometimes difficult to understand.

3. Text Adjustment

A. Text is compatible with assistive technology.	Pass
Additional Information:	Used Adobe Reader XI and the text size was adjustable on pages 11-15.
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,	Pass



media player, or reader) that offers this functionality).	
Additional Information:	Used Adobe Reader XI to adjust the font and background colors. The colors were adjustable on pages 11-15.

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:	Used Adobe Reader XI and the text reflowed on pages 11-15.
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 version.

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.	Pass
Additional Information:	Used NVDA and checked the digital resource layout on pages 13, 16, 17, 19, and 20. The reading order logically corresponds to the page layout.

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	Fail
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such as a browser, media player, or reader that offers this functionality).	
Additional Information:	Used NVDA and checked pages 11-42. No headings were found. "No next heading."
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:	Used NVDA and checked lists on pages 11, 22, 34, 64, 67, 69, 82, 85, 89, and 100. No lists were found. "No next list."
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 reader application.

7. Tables

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).	Fail
Additional Information:	Used NVDA to check table markup. 2/10 tables were detected. The tables detected were on pages 236 and 435 but the tables did not indicate the correct number of rows and columns and you cannot navigate the tables using the arrow keys. Checked tables on pages 81, 155, 187, 216, 236, 358, 435, 503, 505, and 521.



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 in book links functioned. Checked in book links on pages 5, 6, 12, 13, 14, 15, 300, 302, 306, 314, 320, 325, 330, 335, 339, 340, 601, 602, 608, 611, 614, 621, 622, 623, 624, and 625.</p>
<p>B. Live hyperlinks take you to any website or webpages external to the book.</p>	<p>Fail</p>
<p>Additional Information:</p>	<p>17/20 live links function and 0/20 live links had an acceptable description. Checked live links on pages 2, 3, 13, 16, 37, 43, 302, 305, 306, 316, 317, 340, 577, 597, 600, 601, 607, and 610.</p>
<p>C. Live links take you to the correct webpage that is functioning properly.</p>	<p>Pass</p>
<p>Additional Information:</p>	<p>17/20 live links functioned. Checked live links on pages 2, 3, 13, 16, 37, 43, 302, 305, 306, 316, 317, 340, 577, 597, 600, 601, 607, and 610.</p>
<p>D. Live links are descriptive enough for the users to know where it should take them.</p>	<p>Fail</p>
<p>Additional Information:</p>	<p>0/20 live links had an acceptable description. Checked live links on pages 2, 3, 13, 16, 37, 43, 302, 305, 306, 316, 317, 340, 577, 597, 600, 601, 607, and 610.</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 not perceive color, and information conveyed by color is also conveyed in other ways.</p>	<p>Fail</p>
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Additional Information:	When color is used to indicate something is a link it is not also underlined, therefore showing no color redundancy. Checked pages 11- 43.
B. Information is conveyed from the sub-categories for contrast.	Pass
Additional Information:	Used Adobe Acrobat XI and Colour Contrast Analyzer to check the headers, text, and simple images for color contrast requirements. All headers pass the color contrast requirements. None of the text for links passes the color contrast requirements but the rest of the text passes. No simple images found. Checked pages 11-43.
C. Contrast for headers passed WCAG AA standards for large texts (contrast ratio 3:1).	Pass
Additional Information:	Used Adobe Acrobat XI and Colour Contrast Analyzer to check the headers and all headers pass the color contrast requirements. Checked pages 11-43.
D. Contrast for text passed WCAG AA standards for normal texts (contrast ratio of 4.5:1).	Fail
Additional Information:	Used Adobe Acrobat XI and Colour Contrast Analyzer to check text and none of the links passed color contrast requirements, the rest of the text passed. Checked pages 11-43.
E. Contrast for simple images (for example, images of atoms) passed WCAG AA standards (contrast ratio of 4.5:1).	N/A
Additional Information:	No simple images found.

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.	N/A
Additional Information:	Cannot check this because do not have Adobe Acrobat Pro.



<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>Cannot check this because do not have Adobe Acrobat Pro.</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>NVDA did not detect non-decorative images, there was no alternative text and the descriptions were not descriptive enough. Additionally NVDA always read the image source/credit information which disrupted the flow. Checked pages 11-74.</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>
<p>Additional Information:</p>	<p>NVDA did not detect complex images, there was no alternative text and the descriptions were not descriptive enough. Additionally NVDA always read the image source/credit information which disrupted the flow. Checked pages 11-74.</p>



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 found.
B. A transcript is provided with all audio content.	N/A
Additional Information:	No multimedia 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 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 found.

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 had labels. Checked figures on pages 11, 12, 13, 14, 15, 16, 17, 18, 19, 20.
B. STEM graphs have appropriate markup that indicates that the image is a graph.	Pass
Additional Information:	10/10 graphs had labels. Checked graphs on pages 106, 174, 260, 262, 481, 518, 522, 524, 525, and 526.
C. STEM equations have appropriate markup that indicates that the image is an equation.	Fail
Additional Information:	0/5 equations were labelled. Checked equations pages 101, 138, 519, 520, and 523. No other equations were found.



D. STEM tables have appropriate markup that indicates the image is a table.	Pass
Additional Information:	10/10 tables had labels. Checked tables on pages 81, 155, 187, 216, 236, 358, 435, 503, 505, and 521.
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 acceptable descriptions and the reader skips over the images. Checked figures on pages 11, 12, 13, 14, 15, 16, 17, 18, 19, 20.
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 acceptable descriptions and the reader skips over the graph. Checked graphs on pages 106, 174, 260, 262, 481, 518, 522, 524, 525, and 526.
G. STEM equations have appropriate notation markup that conveys both the notation (presentation) and meaning (semantics) of the STEM content.	Fail
Additional Information:	0/5 equations had descriptions and reader read the equations incorrectly. Checked equations pages 101, 138, 519, 520, and 523. No other equations were found.
H. Assistive technology used can access the content from the STEM tables.	Fail
Additional Information:	2/10 tables were detected. The tables detected were on pages 236 and 435 but the tables did not indicate the correct number of rows and columns and you cannot navigate the tables using the arrow keys. Checked tables on pages 81, 155, 187, 216, 236, 358, 435, 503, 505, and 521.



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.	Pass
Additional Information:	Pgs 80-50 were checked. The text is available to be used by assistive technology. The text-to-speech functionality allows users to hear each page being read in a top-down, left-to-right fashion.

3. Text Adjustment

A. Text is compatible with assistive technology.	Pass
Additional Information:	Pgs 40-50 were checked. Text reflows with size adjustment.
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).	Pass
Additional Information:	Pgs 40-50 were checked. The document successfully supports adjustment of text color when using a black background and green text. However, images do not change color (see pg 40-50).

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	Pass
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such as a browser, media player, or reader that offers this functionality).	
Additional Information:	Pgs 40-45 were checked. Text reflows with zoom.
B. If the digital resource is an electronic alternative to printed materials, the page numbers correspond to the printed material.	N/A
Additional Information:	Need additional information. We do not have printed material to compare it too.

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.	Pass
Additional Information:	Pgs 100-110 were checked. While the reading order for paragraphs was executed in a logical fashion.

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:	No method provided that allows user to bypass sections of text. The tagged PDF, Title, Bookmarks, and Headings all failed using the accessibility checker.
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:	No markups found. The Tagged PDF, Title, Bookmarks, and Headings all failed.
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:	No additional eReader used.

7. Tables

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).	Fail
Additional Information:	Pgs 75-175 were checked. Using the accessibility checker, the rows, TH and TD, headers and regularity all failed. Manual check with Read Out Loud determined that tables are not read in a coherent logical fashion (see pgs 78, 79, 80, 153, 154).

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:	19/20 live links worked. Pg's 250-450 were checked. Website



	(http://openstaxcollege.org/1/growing_planet2) on pg 338 is expired.
C. Live links take you to the correct webpage that is functioning properly.	Pass
Additional Information:	19/20 live links worked. Pg's 250-450 were checked. Website (http://openstaxcollege.org/1/growing_planet2) on pg 338 is expired.
D. Live links are descriptive enough for the users to know where it should take them.	Fail
Additional Information:	0/20 live links had a description. Pg's 250-450. The book uses url addresses. (ex. http://openstaxcollege.org/1/gymnosperm on pg 347, http://openstaxcollege.org/1/pollinators on pg 357).

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 200-260 were checked. Large chapter headings passed with a ratio of 689:1.



D. Contrast for text passed WCAG AA standards for normal texts (contrast ratio of 4.5:1).	Pass
Additional Information:	Pgs 200-260 were checked. The text was above the ratio 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 200-260 were checked. 6/10 Pass. There was a mix of simple images passed and failed. (ex. Fail with 2.0:1 on pg 205, Fail with 2.05:1 on pg 231, Fail with 1.08:1 on pg 258, Fail with 1.63:1 on pg 256).

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.	Fail
Additional Information:	Using the accessibility checker the primary language failed.
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.	Fail
Additional Information:	Using the accessibility checker the primary language failed.

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 400-465 were checked. The text offered descriptions 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:	Pgs 400-465 checked. However, no description is not adequate. The descriptions merely characterize what the image is portraying without mentioning essential key words included on the image itself. Additionally, the image itself often has words that cannot be read by Read Out Loud function. 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

<p>A. The digital resource content does not contain anything that flashes more than three times in any one-second period.</p>	<p>Pass</p>
<p>Additional Information:</p>	<p>Pgs 30-45 were checked. No flickering content was observed. Using the accessibility checker, screen flicker passed.</p>

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

<p>A. STEM figures have appropriate markup that indicates that the image is a figure.</p>	<p>Fail</p>
<p>Additional Information:</p>	<p>0/10 were appropriately marked up (see pgs 414, 415, 417, 418, 419, 420). 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.</p>
<p>B. STEM graphs have appropriate markup that indicates that the image is a graph.</p>	<p>Fail</p>
<p>Additional Information:</p>	<p>0/10 were properly marked up (see pgs 258, 501, 516, 524, 527, 605). Overall graphs were not properly marked up to be read logically.</p>
<p>C. STEM equations have appropriate markup that indicates that the image is an equation.</p>	<p>Fail</p>
<p>Additional Information:</p>	<p>2 equations were found in the entire book and were properly marked up. (see pg 136). Read Out Loud function read from left-to-right, top-down.</p>
<p>D. STEM tables have appropriate markup that indicates the image is a table.</p>	<p>Fail</p>
<p>Additional Information:</p>	<p>5/10 tables were properly marked up. Some did not contain proper markup (see pg 78, 79, 80, 153, 154, 433, 617).</p>



E. STEM figures have appropriate notation markup that conveys both the notation (presentation) and meaning (semantics) of the STEM content.	Fail
Additional Information:	10/10 were appropriately marked up (see pgs 400-500). 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 258, 501, 516, 524, 527, 605). 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:	2 equations were found in the entire book and did not have proper notation (see pg 136).
H. Assistive technology used can access the content from the STEM tables.	Fail
Additional Information:	5/10 tables had proper notation. (See pg 78, 79, 80, 153, 154, 433, 617.)

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 element's name, type, and status (e.g. "Play, button, selected").	N/A
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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