Accessibility Review of Proclamation 2014 *Digital Materials*

Auditing Results and Analysis

for Texas Education Agency

Final Report

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Executive Summary

What this report is about

Savvy Technology Solutions has reviewed 1500 sample pages from 23 publishers' products, which consisted of digital materials in PDF format, Web Application format, and Flash format found on all the publishers' websites, for the purpose of auditing to ascertain whether these digital materials meet the needs of students with disabilities in Texas. To that end, we tested against the Web Content Accessibility Guidelines 2.0 Levels A and AA. Web Content Accessibility Guidelines (WCAG), containing a total of 38 criteria, are developed through the World Wide Web Consortium (W3C) process in cooperation with individuals and organizations around the world, with the goal of providing a single shared standard for web content accessibility that meets the needs of individuals, organizations, and governments internationally.

Our testing team is comprised of both visually impaired and normal-sighted testers. They used a three-step testing methodology (which combines both comprehensive manual testing and automated testing; see Appendix B) and determined that the 1500 pages reviewed contain significant barriers that could prevent people with disabilities from receiving equal access to information and function. This documentation represents our findings from the accessibility review of the sample pages in the 23 publishers' products and provides detailed issue descriptions and recommendations for remedying the accessibility non-compliance for the top three issues we identified.

How to achieve accessibility

Four Principles (POUR) put people at the center of the process

TheW3C's WCAG 2.0 standards are organized in layers of guidance with the goal of making content more accessible. The topmost layer consists of four principles that provide the foundation for web accessibility:

- **Perceivable:** Information and user interface components must be presented to users in ways they can recognize. This means users must be aware of all the information being presented. It cannot be invisible to all of their senses.
- **Operable:** User interface components and navigation must be possible. This means users must be able to operate the interface. The interface cannot require interactions that a user cannot perform.

- **Understandable:** Information and the operation of the user interface must be clear and logical. This means users must be able to easily grasp the presented information and the operation of the user interface. The content or operation cannot be beyond their comprehension.
- **Robust:** Content must be robust enough that it can be interpreted reliably by a wide variety of user agents, including assistive technologies. This means users must be able to continue to access the content as technologies advance. As technologies and user agents evolve, the content should remain accessible.

Conveniently, these principles spell out a simple acronym: **POUR**. The idea is to create POUR websites and digital materials.

[Note: The acronym POUR was coined by WebAIM (Web Accessibility in Mind), a non-profit organization based at the Utah State University that provides web accessibility solutions.]

List of Publishers

The following is a list of the 23 publishers of the *Proclamation 2014* digital material products we audited for accessibility.

- Accelerate Learning, Inc.
- Achieve3000, Inc.
- Adaptive Curriculum
- Agile Mind Educational Holdings, Inc.
- Compuscholar, Inc.
- Delta Education dba CPO Science
- Discovery Education, Inc.
- Edusmart
- Ergopedia, Inc.
- ExploreLearning / LAZEL, Inc.
- Goodheart-Willcox Company, Inc.
- Houghton Mifflin Harcourt Depository
- McGraw-Hill Companies
- Pearson Education Depository
- Reasoning Mind, Inc.
- Sapling Learning
- Scientific Minds, LLC
- Skylight Publishing
- Technical Laboratory Systems
- Texas State University
- TPS Publishing, Inc.
- Urban Online dba AlbaCorps Publishing
- Zingy Learning

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Pages Tested (1500 pages in total)

How the pages were selected

For each digital material product, we identified at least 3 pages using the following criteria:

1. Login page

2. Home page (or default landing page after login)

3. Page that exhibits certain digital material features, identified through our testing experience, that are prone to accessibility non-compliance. These features include data tables; lists; interactive elements, i.e., forms/form controls (e.g., textboxes, checkboxes, radio buttons); buttons; links; images; audio/video media; frames; and "widgets" (e.g., Flash objects, JavaScript content).

[Note: If the Login and/or Home pages for multiple products are similar or identical in content, we selected three pages according to criterion 3 for these products.]

For each product, if there was not sufficient different digital material features in the three selected pages to adequately test for accessibility, we identified additional pages according to criterion 3 to ensure other features were included.

After analyzing the 23 publishers' products, we determined that a total of 1,500 sample pages were needed to present enough digital material features to adequately test for accessibility.

The 1500 identified pages can be categorized into 3 formats:

*   736 Web Applications (HTML)

*   360 Flash (HTML with embedded Adobe Flash content)

*   404 PDF pages from 151 PDF files containing a total of 33,707 PDF pages

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Table of Testing Results

Disclaimer:

- The results represent only the sample pages we reviewed.

- The red color designates those criteria with a failure rate of 90% and above. It is a subjective definition.

Legend:

- Cells in Red: Failed at least 90% or above

- Cells in Green: 100% pass

Principles of Accessibility (POUR)	Guideline	Criteria	Detailed Description of Criteria	Failed %	Pass %	N/A %
Perceivable	Text Alternatives: Provide text alternatives for any non-text content	1.1.1(A) Non-text Content	All non-text content presented to the user has a text alternative that serves the equivalent purpose.	82%	18%	0%
	Time-based Media: Provide alternatives for time-based media	1.2.1(A) Audio-only and Video-only (Prerecorded)	A descriptive text transcript (including all relevant visual and auditory clues and indicators) is provided for non-live, web-based audio (audio podcasts, MP3 files, etc.). A text or audio description is provided for non-live, web-based video only (e.g., video that has no audio track).	61%	39%	86%
		1.2.2(A) Captions (Prerecorded)	Synchronized captions are provided for non-live, web-based video (e.g., YouTube videos).	50%	50%	88%
		1.2.3(A) Audio Description or Media Alternative (Prerecorded)	A descriptive text transcript OR audio description audio track is provided for non-live, web-based video.	92%	8%	91%

Principles of Accessibility (POUR)	Guideline	Criteria	Detailed Description of Criteria	Failed %	Pass %	N/A %
		1.2.4(AA) Captions (Live)	Synchronized captions are provided for all live multimedia that contains audio (e.g., audio-only broadcasts, web casts, video conferences, Flash animations, etc.).	0%	100%	99%
		1.2.5(AA) Audio Description (Prerecorded)	Audio descriptions are provided for all video content. NOTE: Only required if the video conveys content visually that is not available in the default audio track.	70%	30%	91%
	Adaptable: Create content that can be presented in different ways (e.g., simpler layout) without losing information or structure	1.3.1(A) Info and Relationships	Information, structure, and relationships conveyed through presentation can be programmatically determined or are available in text.	64%	36%	0%
		1.3.2(A) Meaningful Sequence	When the sequence in which content is presented affects its meaning, a correct reading sequence can be programmatically determined.	53%	47%	5%
		1.3.3(A) Sensory Characteristics	Instructions provided for understanding and operating content do not rely solely on sensory characteristics of components such as shape, size, visual location, orientation, or sound.	1%	99%	2%
	Distinguishable: Make it easier for users to see and hear content, including separating foreground from background	1.4.1(A) Use of Color	Color is not used as the only visual means of conveying information, but also for indicating an action, prompting a response, or distinguishing a visual element.	4%	96%	2%
		1.4.2 (A) Audio Control	If any audio on a web page plays automatically for more than 3 seconds, either a mechanism is available to pause or stop the audio, or a mechanism is available to control audio volume independently from the overall system volume level.	16%	84%	88%
		1.4.3(AA) Contrast	Text and images of text have a contrast ratio of at least 4.5:1. Large text (over 18 point or 14 point bold) has a contrast ratio of at least 3:1.	65%	35%	0%

| Principles of Accessibility (POUR)	Guideline	Criteria	Detailed Description of Criteria	Failed %	Pass %	N/A %
		1.4.4 (AA) Resize Text	Except for captions and images of text, text can be resized without assistive technology up to 200 percent without loss of content or functionality.	42%	58%	0%
		1.4.5(AA) Images of Text	If the technologies being used can achieve visual presentation, text—rather than images of text—is used to convey information.	22%	78%	35%
Operable	Keyboard Accessible: Make all functionality available from a keyboard	2.1.1(A) Keyboard	All functionality of the content is operable through a keyboard interface without requiring specific timings for individual keystrokes, except where the underlying function requires input that depends on the path of the user's movement and not just the endpoints.	61%	39%	0%
		2.1.2(A) No Keyboard Trap	If keyboard focus can be moved to a component of the page using a keyboard interface, then focus can be moved away from that component using only a keyboard interface, and, if it requires more than unmodified arrow or tab keys or other standard exit methods, the user is advised of the method for moving focus away.	4%	96%	5%
	Enough Time: Provide users enough time to read and use content	2.2.1(A) Timing Adjustable	For each time limit that is set by the content, at least one of the following is true.	74%	26%	59%
		2.2.2(A) Pause, Stop, Hide	Automatically moving, blinking, or scrolling content that lasts longer than 5 seconds can be paused, stopped, or hidden by the user. Moving, blinking, or scrolling can be used to draw attention to or highlight content as long as it lasts less than 5 seconds. Automatically updating content (e.g., automatically redirecting or refreshing a page, a news ticker, AJAX updated field, a notification alert, etc.) can be paused, stopped, or hidden by the user or the user can manually control the timing of the updates.	18%	82%	90%

Principles of Accessibility (POUR)	Guideline	Criteria	Detailed Description of Criteria	Failed %	Pass %	N/A %
	Seizures: Do not design content in a way that is known to cause seizures	2.3.1(A) Three Flashes or Below Threshold	Web pages do not contain anything that flashes more than three times in any one second period, or the flash is below the general flash and red flash thresholds.	22%	78%	99%
	Navigable: Provide ways to help users navigate, find content, and determine where they are	2.4.1(A) Bypass Blocks	A mechanism is available to bypass blocks of content that are repeated on multiple web pages.	61%	39%	62%
		2.4.2(A) Page Titled	Web pages have titles that describe topic or purpose.	73%	27%	0%
		2.4.3(A) Focus Order	If a web page can be navigated sequentially and the navigation sequences affect meaning or operation, focusable components receive focus in an order that preserves meaning and operability.	26%	74%	5%
		2.4.4(A) Link Purpose (In Context)	The purpose of each link can be determined from the link text alone or from the link text together with its programmatically determined link context, except where the purpose of the link would be ambiguous to users in general.	40%	60%	5%
		2.4.5(AA) Multiple Ways	More than one way is available to locate a web page within a set of web pages except where the web page is the result of or a step in a process.	1%	99%	4%
		2.4.6(AA) Headings and Labels	Headings and labels describe topic or purpose.	11%	89%	0%
		2.4.7(AA) Focus Visible	Any keyboard operable user interface has a mode of operation where the keyboard focus indicator is visible.	48%	52%	0%
Understandable		3.1.1(A) Language of Page	The default human language of each web page can be programmatically determined.	62%	38%	0%

Principles of Accessibility (POUR)	Guideline	Criteria	Detailed Description of Criteria	Failed %	Pass %	N/A %
	Readable: Make text content readable and understandable	3.1.2(AA) Language of Parts	The human language of each passage or phrase in the content can be programmatically determined except for proper names, technical terms, words of indeterminate language, and words or phrases that have become part of the vernacular of the immediately surrounding text.	68%	32%	82%
	Predictable: Make web pages appear and operate in predictable ways	3.2.1(A) On Focus	When any component receives focus, it does not initiate a change of context.	3%	97%	2%
		3.2.2(A) On Input	Changing the setting of any user interface component does not automatically cause a change of context unless the user has been advised of the behavior before using the component.	1%	99%	81%
		3.2.3(AA) Consistent Navigation	Navigational mechanisms that are repeated on multiple web pages within a set of web pages occur in the same relative order each time they are repeated, unless a change is initiated by the user.	0%	100%	7%
		3.2.4(AA) Consistent Identification	Components that have the same functionality within a set of web pages are identified consistently.	23%	77%	6%
	Input Assistance: Help users avoid and correct mistakes	3.3.1(A) Error Identification	If an input error is automatically detected, the item that is in error is identified and the error is described to the user in text.	8%	92%	96%
		3.3.2(A) Labels or Instructions	Labels or instructions are provided when content requires user input.	60%	40%	0%
		3.3.3(AA) Error Suggestion	If an input error is automatically detected and suggestions for correction are known, then the suggestions are provided to the user, unless the security or purpose of the content would be jeopardized.	22%	78%	99%

Principles of Accessibility (POUR)	Guideline	Criteria	Detailed Description of Criteria	Failed %	Pass %	N/A %
		3.3.4(AA) Error Prevention (Legal, Financial, Data)	If the user can change or delete legal, financial, or test data, the changes or deletions are reversible, verified, or confirmed.	40%	60%	99%
Robust	Compatible: Maximize compatibility with current and future user agents, including assistive technologies	4.1.1(A) Parsing	In content implemented using markup languages, elements have complete start and end tags, elements are nested according to their specifications, elements do not contain duplicate attributes, and any IDs are unique, except where the specifications allow these features.	71%	29%	0%
		4.1.2(A) Name, Role, Value	For all user interface components (including but not limited to form elements, links, and components generated by scripts), the names and roles can be programmatically determined; states, properties, and values that can be set by the user can be programmatically set; and notification of changes to these items is available to user agents, including assistive technologies.	61%	39%	3%

Chart of Auditing Results

Chart of Auditing Results

Legend:
- Failed %
- Pass %
- N/A %
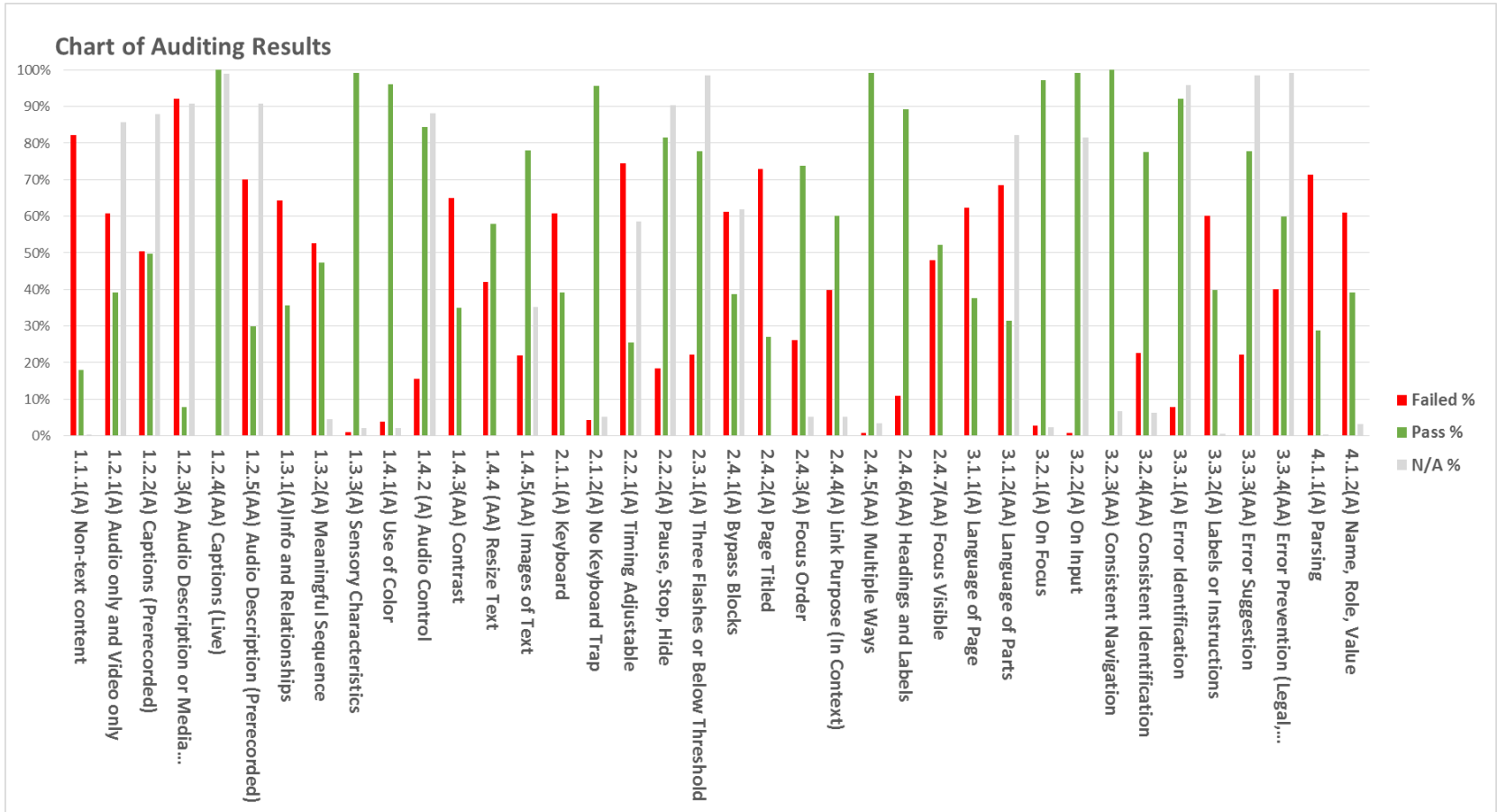
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POUR Accessibility Analysis of All Publishers' Digital Materials

As the POUR principles are the overarching guidance for developing accessible products, we used these principles as the frame of reference as we evaluated the accessibility of all the publishers' digital materials. The following is an analysis of the prominent issues identified per the POUR principles. **100% of all 1500 pages tested fail at least 1 WCAG 2.0 Level A/AA Criterion.**

Perceivable.

99% of all pages tested fail at least 1 Perceivable Criterion.

In developing a perceivable page, important elements to consider include static images, multimedia elements, headings, tables, lists, and forms. Developers must ensure that the visual information and structure presented by these elements can be rendered in other formats such as no style sheets, resized text, or no color. Color contrast of text is also an important consideration.

Issues:

The criterion that many of the tested pages failed to satisfy was Criterion 1.1.1(A) Non-text Content. Nearly 99% of all pages tested contained at least one image, and of these, over 80% failed this criterion.

The second most violated criterion was Criterion 1.3.1(A) Info and Relationships. Of all tested pages, nearly 65% failed this criterion for a variety of reasons. Turning off style sheets is an effective test for this criterion, and doing so quickly revealed whether the webpage's content remained readable and navigable. Many of the test pages failed to satisfy this criterion when style sheets were turned off.

Operable.

97% of all tested pages fail at least 1 Operable Criterion.

In developing an operable product, areas to consider include ensuring that all interactive components (links, form controls, buttons) can be accessed through a keyboard interface and that users never get into a keyboard trap. To achieve this, logical tabbing order with a clearly defined focus indicator is a must. Additionally, titling pages and providing links with accessible information as to their purpose greatly helps users to navigate, find content, and determine where they are on the webpage.

Issues:

Nearly 65% of all tested pages failed the 2.1.1(A) Keyboard Criterion. Typically, the failed pages had an improper use of the tab index attribute or an interactive component that called for a dependent-event handler (e.g., onclick) rather than an independent event handler (e.g., onSelect).

Testing has revealed that the simple but important Criterion 2.4.2(A) Page Titled is often overlooked. Nearly three-fourths of all tested pages failed this criterion, using the same title for all of a website's pages, failing to set title tags, or having page titles that are not indicative of the page content.

Understandable.

70% of all pages fail at least 1 Understandable Criterion.

Predictable behavior of a product is a key characteristic for its understandability. Navigation sequence should be consistent through all the pages of a website. This ensures that as users interact with the product (e.g., focusing on or entering data into an active element), there is no unexpected change in the context. Also, the product should assist users with inputting data; this entails proper labeling of forms, as well as identifying and describing any input errors to the user in text. Lastly, setting the default language of the contents of a page is simple but greatly aids screen reader users.

Issues:

Over 60% of all tested pages failed Criterion 3.1.1(A) Language of Page. The remedy is straightforward: setting the lang attribute in the html element to the ISO 639 language code that matches the language of the page. The pages that failed simply do not have the lang attribute specified. Modern screen readers can recognize this attribute and set its voice language accordingly, which results in a quality user experience.

60% of tested pages failed Criterion 3.3.2(A) Labels or Instructions. The pages that failed all have at least a few form controls, such as a textbox to simply enter a page number to go to, but lack labels identifying the identities of the form controls. A non-sighted user will not understand what to enter into these unlabeled form controls. For an unlabeled textbox, the screen reader simply says "enter text." Properly labeled form controls will inform screen reader users what type of text to input.

Robust.

80% of all tested pages fail at least 1 Robust Criterion.

Robust products successfully address two areas. First, developers strictly adhere to the coding conventions specified for the technology (e.g., the World Wide Web Consortium's HTML5 specification). Second, if user interface elements (e.g., links, form controls) are custom-made (not using accessible standard user interface elements), then developers provide whatever necessary additional elements (e.g., Web Accessibility Initiative - Accessible Rich Internet Applications elements) that will allow the custom-made user interface elements to be controlled by assistive technologies.

Issues:

A considerable number of tested pages failed both criteria specified for robustness. Over 70% of pages failed Criterion 4.1.1(A) Parsing, and nearly 60% failed Criterion 4.1.2(A) Name, Role, Value. The parsing errors found in the failed pages include missing end tags, use of deprecated HTML4 elements, and not declaring the DOCTYPE. The pages that failed Criterion 4.1.2 predominantly use Flash and JavaScript technologies. Nearly 30% of the sample test pages incorporate Flash content, which is inherently inaccessible especially for screen readers. The Flash technology does provide developers an accessibility API, which does not appear to be integrated into most of the Flash content we tested. Pages using JavaScript typically failed this criterion because the scripts convert the HTML div and span elements into user interface controls that can receive no focus.

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Conclusion

The digital materials contained in the pages of all the publishers' websites we reviewed provide an abundance of media content, interesting information, and effective ways to engage users. However, there are barriers inherent in the design choices that will prevent assistive technology users and other people with disabilities from full and meaningful participation. Based on our accessibility testing results, we have identified the three most serious accessibility issues, which we described in detail earlier in this report, and made recommendations and remedies accordingly.

As stated in the Executive Summary of this report, web content accessibility is most easily achieved when we place users at the center of the design process. Providing a quality user experience for users with and without disabilities is paramount. Accessibility guidelines are a good foundation upon which to build accessible web content. However, while a web product may technically meet an accessibility standard's guidelines, unless developers understand the intent behind the guidelines, they may miss the forest for the trees and fail to create a quality user experience for the disabled users.

Rather than an afterthought, web accessibility is a mindset—it should be part of the standard design and development practices, accorded the same level of importance as performance, code integrity, and reliability. As such, we highly encourage developers to keep the POUR Principles in mind during design and development.

Finally, we recommend these excellent accessibility resources for developers wishing to make web accessibility a standard and robust feature of their products:

- **Understanding WCAG 2.0 - A guide to understanding and implementing Web Content Accessibility Guidelines 2.0.**
- **WebAIM: Web Accessibility In Mind**
- **Web Accessibility Initiative (WAI)**

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Appendix A: User Experience – From a non-sighted user's perspective

STEMscopes, Accelerate Learning

The design of the navigation in the STEMscopes environment is not always clear, which makes testing for accessibility difficult. One example of this issue is the absence of a clear path to textbook material. After testing the navigation of the site at length, I came to the conclusion that one of the main problems contributing to the difficulty with navigation is the lack of segregation between the teacher section and the student section.

The teacher section gives the user access to all of the standardized testing materials on the site, but these materials are not relevant to a student user. Further, in the "scope" section, which is designed for students, the user still views the site as if he were the teacher. There is no clear indication of which materials are meant for the student because teacher and student materials are bundled together. This kind of bundling of content makes it difficult for the user to determine his location on the site or how to navigate to where he wants to go. Having a clear separation between the student section and the teacher section will make navigation more efficient. Further, although PDFs are available in some sections, it is not always clear what purpose they serve.

I also did not find explanations for the content or observe adherence to website navigation convention in the STEMscope environment. Additionally, the ambiguous navigation and the bundling of content make accessibility more challenging for users with disabilities. From the way the pages and sections are designed, it would be extremely difficult for a blind student to navigate between pages solely using a screen reader.

To make the STEMscope environment more accessible, we recommend streamlining the design of navigation and providing more explanation for the intended use of the content.

Adaptive Curriculum

The product's content relies primarily on visual digital material, and thus is very difficult for visually impaired students to use.

Agile Mind Biology

(Tested using Firefox 43.0.4, Google Chrome 47.0.2526.111, Internet Explorer 11.0.9600.18163 and Opera 34.0.2036.50)

Testing was conducted on a Windows 7 laptop. The latest version of Safari was not available for testing.

Below is a table showing the results and functions of the e-text and the browsers in which they were tested. For a more detailed description for each function in a specific browser, please see testing notes below.

Table Key

works as expected ✓

works (but needs bug fixes or improvements) 〰

did not work ✗

	Firefox	**Internet Explorer**	**Opera**	**Google Chrome**
Screen Readers	✓	✓	✗	✗
Page Navigation	〰	〰	✗	〰
Search Box Function	✗	✗	✗	✗

Testing results for Agile Mind Biology (Firefox)

Functionality and tools:

Screen readers: worked in the text-only portions of the content and gave the user zoom functionality. Other portions of the content could not be viewed successfully.

Page navigation: navigation could be much smoother. It is somewhat difficult to find what you are looking for. Page navigation functions (for textbook content) are located in the top right corner, which is easy to miss. The table of contents is in the standard location on the left hand side.

Search box function: this function did not work when the word "biology" was searched. It appears that the function is rather general and only able to search for topics rather than specific words.

Testing results for Agile Mind Biology (Internet Explorer)

Functionality and tools:

Screen readers: same result as the previous test (Firefox).

Page navigation: same result as the previous test (Firefox).

Search box function: same result as the previous test (Firefox).

Testing results for Agile Mind Biology (Google Chrome)

Functionality and tools:

    Screen readers: website functions did not work in this browser with screen readers.

    Page navigation: Same result as the previous test (Firefox, Internet Explorer).

    Search box function: same result as the previous test (Firefox, Internet Explorer).

Final Thoughts

    Accessibility can be improved for these digital material products by clearly identifying keyboard focus and providing ample alternative texts for meaningful images.

Achieve3000 Science

(Tested using Firefox 43.0.4, Google Chrome 47.0.2526.111, Internet Explorer 11.0.9600.18163 and Opera 34.0.2036.50)

    Testing was conducted on a Windows 7 laptop. The latest version of Safari was not available for testing.

    Below is a table showing the results and functions of the e-text and the browsers in which they were tested. For a more detailed description for each function in a specific browser, please see testing notes below.

Table Key

works as expected ✅

works (but needs bug fixes or improvements) 〰️

did not work ❌

	Firefox	Internet Explorer	Opera	Google Chrome
Screen Readers	✔️	〰️	〰️	〰️
Page Navigation	✔️	✔️	✔️	✔️
Zoom Function	✔️	✔️	✔️	✔️
Notes Function	✔️	〰️	✔️	✔️

Dictionary Function	✓	✓	✓	✓
Highlight Function	~	~	~	~
Search Box Function	✓	✓	✓	✓

Testing results for the Achieve3000 Science interactive module (Firefox)

Functionality and tools:

Screen readers: Screen readers are successfully tested on this platform. This is a powerful aid in making the content accessible to visually impaired users. Also, this module features an effective built-in screen reader. (ZoomText10 was the stand-alone screen reader used.)

Page navigation: Page navigation is simple with a standard page selector located on the right hand side of the browser. Each page has six sections to interactively reinforce the content.

Zoom function: The user has access to a zoom function, which would not be available had the screen readers not worked with this content. (Function not built into the content.)

Notes function: The notes function works as expected. It has options for text size, text style (boldface and italics), spell check, and other functions commonly available in a word processor.

Dictionary function: This function is helpful, as it provides a list of the vocabulary on each page and the option to have the words and their definitions read to the user.

Highlight function: This function works as expected, except users cannot remove specific highlights. There is the added benefit of having a collective window that displays all the highlighted texts.

Search box function: This function works as expected. It is fast and searches all available material for each query.

Testing results for the Achieve3000 science interactive module (Internet Explorer)

Functionality and tools:

Screen readers: Only the screen reader built into the content worked in this browser. The stand-alone screen reader that was tested to read the content did not work. The zoom function on the built-in screen reader functioned as usual.

Page navigation: Same result as the previous test (Firefox)

Zoom function- Same result as the previous test (Firefox)

Notes function: Not all functions worked. For example, the user cannot change the font size.

Dictionary function: Same result as the previous test (Firefox)

Highlight function: Same result as the previous test (Firefox)

Search box function: Same result as the previous test (Firefox)

Testing results for the Achieve3000 science interactive module (Opera)

Functionality and tools:

Screen readers: Same result as the previous test (Internet Explorer)

Page navigation: Same result as the previous test (Firefox, Internet Explorer)

Zoom function: Same result as the previous test (Firefox, Internet Explorer)

Notes function: Same result as the previous test (Firefox)

Dictionary function: Same result as the previous test (Firefox, Internet Explorer)

Highlight function: Same result as the previous test (Firefox, Internet Explorer)

Search box function: Same result as the previous test (Firefox, Internet Explorer)

Testing results for the Achieve3000 science interactive module (Google Chrome)

Functionality and tools:

Screen readers: Same result as the previous test (Internet Explorer, Opera)

Page navigation: Same result as the previous test (Firefox, Internet Explorer, Opera)

Zoom function: Same result as the previous test (Firefox, Internet Explorer, Opera)

Notes function: Same result as the previous test (Firefox, Opera)

Dictionary function: Same result as the previous test (Firefox, Internet Explorer, Opera)

Highlight function: Same result as the previous test (Firefox, Internet Explorer, Opera)

Search box function: Same result as the previous test (Firefox, Internet Explorer, Opera)

Final Thoughts

The interface of Achieve3000's product is well designed. With a few adjustments and bug fixes in certain browsers as explained above, this interface will be a very robust design that provides accessibility with remarkable success.

CompuScholar Programming

(Tested using Firefox 43.0.4 and Internet Explorer 11.0.9600.18163)

Testing was conducted on a Windows 7 laptop. The latest version of Safari was not available for testing.

Below is a table showing the results and functions of the e-text and the browsers in which they were tested. For a more detailed description for each function in a specific browser, please see testing notes below.

Table Key

works as expected ✓

works (but needs bug fixes or improvements) ～

did not work ✗

	Firefox	**Internet Explorer**
Screen Readers	✓	～
Page Navigation	✓	✓

Testing results for the Compuscholar Programming textbook, student edition (Firefox)

Functionality and tools:

Screen readers: Screen readers worked as expected in this browser.

Page navigation: Page navigation was simple and intuitive. The layout was free of clutter, and it was extremely easy to navigate through the chapters.

Testing results for the CompuScholar Programming textbook, student edition (Internet Explorer)

Functionality and tools:

Screen readers: While the screen reader successfully read the assessment portion of the content, it did not work in the textbook portion of the content.

Page navigation: Same result as the previous test (Firefox)

Final Thoughts

Although the materials tested for CompuScholar do not feature many functions, the navigation of the website is exceptionally intuitive. It can serve as a model for publishers wishing to improve their navigation. Also, the video content is accompanied by adequate companion content, giving satisfactory access to visually impaired users.

Delta Education (Science, Student Edition)

(Tested using Firefox 43.0.4 Internet Explorer 11.0.9600.18163)

   Testing was conducted on a Windows 7 laptop. The latest version of Safari was not available for testing.

   Below is a table showing the results and functions of the e-text and the browsers in which they were tested. For a more detailed description for each function in a specific browser, please see testing notes below.

Table Key

works as expected ✅

works (but needs bug fixes or improvements) 〰️

did not work ❌

	Firefox	Internet Explorer
Screen Readers	❌	❌
Page Navigation	〰️	〰️
Zoom Function	✅	✅
Drag Page Function	✅	✅
Full screen Function	✅	✅
Search Box Function	✅	✅

Testing results for the Delta Science textbook, student edition (Firefox)

Functionality and tools:

   Screen readers: Screen readers do not work inside this e-text.

   Page navigation: Onscreen arrows are used to advance or go back one page at a time. Page selector (typing in desired page number) works as expected. Double left-pointing arrow goes back one

page at a time, rather than bringing the user to the beginning of the book or table of contents as would be expected. Other page navigation functions, in full screen mode, include keyboard arrows, and page up and page down keys.

Zoom function: The zoom function works well, with straightforward operation and reasonable increments in zooming in.

Drag page function: This function works as expected. The keyboard arrows are used to scroll up and down on a page.

Search box function: This function works as expected in a test that used the word "science" in a search.

Testing results for the Delta Science textbook, student edition (Internet Explorer)

Functionality and tools:

Screen readers: Same result as the previous test (Firefox)

Page navigation: Same result as the previous test (Firefox)

Zoom function: Same result as the previous test (Firefox)

Drag page function: Same Result as the previous test (Firefox)

Search box function: Same result as the previous test (Firefox)

Final Thoughts

The problem with Flash content in Delta Education's interface is found in a number of other products we tested that rely on Flash players. In order to make such content more accessible to users with disabilities, we recommend the implementation of other functions that are compatible with assistive technologies such as screen readers.

Discovery Education

Limited material was available to conduct the testing of Discovery Education's product. The navigation was somewhat difficult, so it took more time than expected for me to find the text material. Once I located the material, it became apparent that testing the text content was unnecessary because the text portion was brief. This product focuses more on video content and interactive assignments. However, since visually impaired users cannot view the videos, it will be important to ensure the audio is very descriptive for it to be useful for these users.

Another way to improve the accessibility is to add more text to the e-text portion of the material and to simplify navigation. For example, the current layout of the tabs used for navigation—

Engage, Explore, Explain, Elaborate, and Evaluate—can be confusing; it is unclear to the user where the content begins or ends. To make navigation more intuitive, we recommend presenting the content in the tabs sequentially and guiding the users through it from one concept to the next. It will also streamline navigation to separate the teacher materials from student content. Another issue with navigation is that when I click on any material inside the text, such as a video or e-text, there is no easy way to return to the material I was viewing previously. Fixing this problem will prevent users from becoming lost in the content.

Lastly, we recommend expanding the number of functions in the text portion of the content. The only available functions at this time include the integrated screen reader, which was slower than my experience with other products, a search function that worked as expected, a highlight function, and a notes function. Additionally, the interactive glossary contains video but no audio content; adding the audio component will make the videos useful for users with disabilities.

Final Thoughts

In conclusion, to improve accessibility for visually impaired students, we suggest that Discovery Education streamline this product's navigation, increase the amount of text explanation, and provide audio content to accompany the videos.

Edusmart publishing

These products have issues with navigation and content. When you first go into the content section of the site, you are greeted with a set of videos that can be played through the web browser; however, it appears that by default the contents of the video are spoken in Spanish rather than English. In order to change this, you have to hunt for the language setting on the right side of the screen, which is easily missed. It is a good idea to have these videos in multiple languages, but the setting to control what language is selected should be easier to find. The videos are comprised of pictures and audio. Including both elements is a good idea; however, the audio portion is lacking because the individual narrating the content makes himself sound robotic. Going through the video content playback is also difficult because you must manually click a button to advance through the content.

This website also exhibits issues with relevant content separation. The teacher content and the student content are put together making navigation more arduous. It is difficult to tell when you are clicking on student content versus when you're clicking on teacher content. Some of the teacher content consists of PDF files while the student content is mostly videos. This publisher should consider new strategies to streamline navigation and make the audio content in the videos (which is very important to

visually impaired students) more realistic and engaging. Also, it should improve video playback so the presentation will advance automatically. The addition of more text material for the students could also be helpful.

Ergopedia Student Edition

(Tested using Firefox 43.0.4 and Internet Explorer 11.0.9600.18163)

Testing was conducted on a Windows 7 Laptop. The latest version of Safari was not available for testing.

Below is a table showing the results and functions of the e-text and the browsers in which they were tested. For a more detailed description for each function in a specific browser, please see testing notes below.

Table Key

works as expected ✓

works (but needs bug fixes or improvements) ～

did not work ✗

	Firefox	Internet Explorer
Screen Readers	✓	✓
Page Navigation	✓	✓
Search Box Function	✓	✓

Testing results for Ergopedia Student Edition (Firefox)

Functionality and tools:

Screen readers: Screen readers work very well inside this content. Zoomtext was able to read the content without a problem. The textbook also has a built-in screen reader with excellent narration quality.

Page navigation: Page navigation is also excellent. The chapters are divided into easy-to-use sections with a navigation bar at the top of each section. The navigation bar includes functions for page jump, chapter selection, chapter review questions, and video content.

Search box function: A search for the word "wave" was completed successfully without issues.

Testing results for Ergopedia Student Edition (Internet Explorer)
Functionality and tools:

Screen readers: Same result as a previous test (Firefox)

Page navigation: Same result as a previous test (Firefox)

Search box function: Same result as a previous test (Firefox)

Final Thoughts

This publisher has one of the most user-friendly layouts that I have encountered. Some functions can be added for extra usability such as notes and highlighting. The only issue I encountered was that, while trying to play back video content, after clicking on the video link I was redirected to the page of the textbook I was on before clicking the link. All things considered, this product meets usability and accessibility standards and should be used as a benchmark when testing other online textbooks.

Explore Learning

The primary issues I found in Explore Learning's product are similar to the other products we tested. Interactive, visual web content appears to be the primary content without any e-text, which makes it difficult to use for users relying on a screen reader.

To improve the accessibility of this site for student users, we recommend adding e-text or audio content to accompany the visual elements.

Goodheart-Willcox, Food Science (Student Edition)
(Tested using Firefox 43.0.4, Internet Explorer 11.0.9600.18163)

Testing was conducted on a Windows 7 laptop. The latest version of Safari was not available for testing.

Below is a table showing the results and functions of the e-text and the browsers in which they were tested. For a more detailed description for each function in a specific browser, please see testing notes below.

Table Key

works as expected

works (but needs bug fixes or improvements)

did not work

	Firefox	Internet Explorer
Screen Readers		
Page Navigation		
Zoom Function		
Search Box Function		

Testing results for Goodheart-Willcox Food Science (Student Edition) (Firefox)

Functionality and tools:

    Screen readers: Screen readers did not work inside this e-text.

    Page navigation: This e-text makes use of a simple table of contents inside the book with links to each unit inside the chapter. It is simple and easy to operate.

    Zoom function: The zoom function will zoom in reasonable increments, but the response time is very slow.

    Search box function: This function works as expected in a test search using the word "science."

Testing results for Goodheart-Willcox Food Science (Student Edition) (Internet Explorer)

Functionality and tools:

    Screen readers: Same result as the previous test (Firefox)

    Page navigation: Same result as the previous test (Firefox)

    Zoom function: Same result as the previous test (Firefox)

    Search box function: Same result as the previous test (Firefox)

Final Thoughts

This content offers simple and easy navigation, but few functions are available. Of the functions currently available, we recommend refining the zoom function for a more seamless experience and addressing the usability of screen readers.

Holt McDougal Publishing/Houghton Mifflin Harcourt Depository

Holt McDougal's product layout is intuitive and visually pleasing, but I was unable to view the student PDF content on the site.

Navigation is simple, with all relevant materials located on the left-hand side with clear separation between teacher and student materials. It appears that each subject contains a corresponding PDF textbook, but I could not access the PDF content in the student materials for testing. Based on the error message I received when attempting to open the PDF file, I believe the problem occurred when the file was uploaded.

I was able to open the teacher PDF without issue, and after successfully conducting a screen reader test on the Teacher Edition, I expect that the student version will work with a screen reader if the files are formatted similarly.

McGraw Hill, Biology (Student Edition)

(Tested using Firefox 43.0.4, Google Chrome 47.0.2526.111, Internet Explorer 11.0.9600.18163 and Opera 34.0.2036.50)

Testing was conducted on a Windows 7 laptop. The latest version of Safari was not available for testing.

Below is a table showing the results and functions of the e-text and the browsers in which they were tested. For a more detailed description for each function in a specific browser, please see testing notes below.

Table Key

works as expected ✅

works (but needs bug fixes or improvements) 〰️

did not work ❌

Please note: None of the functions in any of the browsers tested received a full checkmark.

	Firefox	Internet Explorer	Opera	Google Chrome
Screen Readers	✗	✗	✗	✗
Page Navigation	~	~	~	~
Zoom Function	~	~	~	~
Notes Function	~	~	~	~
Drag Page Function	~	~	~	~
Highlight Function	~	~	~	~
Search Box Function	✗	~	~	✗

Testing results for McGraw Hill, Biology (Student Edition) (Firefox)

Functionality and tools:

Screen readers: Screen readers did not work inside this e-text. This is surprising because McGraw Hill has an e-text system called "McGraw Hill Connect" that works well with screen readers. It appears that this particular e-text is provided through a different platform.

Page navigation: Onscreen arrows work to advance or go back one page at a time. Page selector (typing in the desired page number) works as expected. But the double left-pointing arrow goes back one page at a time, rather than bringing the user to the beginning of the book or table of contents as would be normally expected. Certain features do not function as page navigation, such as keyboard arrows, and page up and page down keys. They should be enabled for ease of use.

Zoom function: The zoom function works well with straightforward operation and reasonable increments while zooming in. There is also a button that allows the user to return to normal size. However, the "zoom to" is rather counterproductive, as it magnifies the content to such a large size that it becomes unreadable.

Notes function: The notes function offers many options for text formatting. However, to satisfy the intent of WCAG 2.0 accessibility Criteria 3.2.3 (AA) Consistent Navigation and 3.2.4 (AA) Consistent Identification, websites must provide consistent presentation and layout for users who interact with

repeated content. For example, when trying to save a note to the page, it will not open unless the user is once again in the notes function, which is not intuitive. In addition, each time a new note is opened, the default setting is Arial 12-point font. It will be easier for the users if their preference for font or font size is retained for all notes.

Drag page function: This function works when zoomed in and the entire page is visible. It may be more useful if the single page view is not turned on by default. Further, arrows do not work to scroll up and down the page, which should be enabled.

Highlight function: This function works as expected. However, it is not intuitive to change the color. The color swatches also can be made larger for ease of use. One way to improve usability is to have a centralized area to quickly view all the highlighted content in the textbook.

Search box function: A search on the word "science" resulted in a Shockwave Player crash that caused the textbook window to completely close. The second attempt did not crash the Shockwave Player, but the third attempt crashed the Player again. This function should be improved to increase stability and search speed. Also, the search does not include user-added notes, and without any indication that the search box is loading information, the user may mistakenly conclude that the search is stalled.

Testing results for McGraw Hill, Biology (Student Edition) (Internet Explorer)

Functionality and tools:

Screen readers: Same result as the previous test (Firefox)

Page navigation: Same result as the previous test (Firefox)

Zoom function: Same result as the previous test (Firefox)

Notes function: Same result as the previous test (Firefox)

Drag page function: Same result as the previous test (Firefox)

Highlight function: Same result as the previous test (Firefox)

Search box function: This function is more stable in Internet Explorer. Although it did not crash the Shockwave Player, the response time is slow.

Testing results for McGraw Hill, Biology (Student Edition) (Opera)

Functionality and tools:

Screen readers: Same result as the previous test (Firefox, Internet Explorer)

Page navigation: Same result as the previous test (Firefox, Internet Explorer)

Zoom function: Same result as the previous test (Firefox, Internet Explorer)

Notes function: Same result as the previous test (Firefox, Internet Explorer)

Drag page function: Same Result as the previous test (Firefox, Internet Explorer)

Highlight function: Same result as the previous test (Firefox, Internet Explorer)

Search box function: Same result as the previous test (Internet Explorer)

Testing results for McGraw Hill, Biology (Student Edition) (Google Chrome)

Functionality and tools:

Screen readers: Same result as the previous test (Firefox, Internet Explorer, Opera)

Page navigation: Same result as the previous test (Firefox, Internet Explorer, Opera)

Zoom function: Same result as the previous test (Firefox, Internet Explorer, Opera)

Notes function: Same result as the previous test (Firefox, Internet Explorer, Opera)

Drag page function: Same result as the previous test (Firefox, Internet Explorer, Opera)

Highlight function: Same result as the previous test (Firefox, Internet Explorer, Opera)

Search box function: Same result as the previous test (Firefox)

Final Thoughts

As described above, I encountered many issues during the testing of this interface. Another product from this publisher, called "McGraw Hill Connect" and used at Texas State University, has a more streamlined and robust interface that works well with screen readers. McGraw Hill may wish to use the interface of the other product to address the issues described in this report.

Pearson, Math-K Textbook (Student Edition)

(Tested using Firefox 43.0.4, Google Chrome 47.0.2526.111, Internet Explorer 11.0.9600.18163 and Opera 34.0.2036.50)

Testing was conducted on a Windows 7 laptop. The latest version of Safari was not available for testing.

The testing of this math textbook found the same results as the Pearson Science-K e-text. The findings were consistent across all tested browsers with one exception: an advanced search function is available in the student edition of this math e-text. This function works as expected on all browsers. This function allows the user to search for specific material inside the entire textbook or across a specific page range. This advanced search is useful and should be included in all of the Pearson e-texts.

For detailed testing results, please refer to the testing results for Pearson Science-K e-text.

Pearson, Science-K Textbook (Student Edition)

(Tested using Firefox 43.0.4, Google Chrome 47.0.2526.111, Internet Explorer 11.0.9600.18163, and Opera 34.0.2036.50)

Testing was conducted on a Windows 7 laptop. The latest version of Safari was not available for testing.

Testing results for the Pearson K-Science Textbook (Student Edition) (Firefox)

Functionality and tools:

Screen readers: Screen readers are not useable because of the format of this e-text, which contains mostly images.

Notes function: This function did not work as smoothly as expected. After activating this function, the user can create a note, but after clicking "add," the note is not added to the page. This function should be made more intuitive.

Highlight function: This function worked, but the operation was awkward. Once the user highlights a section of text, a notepad appears with a small window to select the highlight color. However, once the text is highlighted, it becomes difficult to read.

Page navigation functions: There are several ways to navigate the e-text. The most efficient options for page navigation are (1) Arrow keys on the keyboard, (2) Click the page to flip, (3) Click the flip page buttons, (4) Type the page number into the box, or (5) Use the navigation pane on the left side of the screen. When going to the next page, a flip graphic is generated, which sometimes delays the loading of the page.

Zoom function: This function works, but it can be streamlined. It is difficult to achieve the desired size, and the zoom function on the browser does not work with this implementation. The zoom function brings up a small window to fine tune the zoom, but it is difficult to work with and could easily be overlooked.

Full screen function: This function works well and is convenient when the user wants to clean up clutter in the browser window.

Auto flip function: This function works, although it flips through the pages perhaps too quickly. I am not sure if students could make use of this function.

Testing results for the Pearson K-Science Textbook (Student Edition) (Google Chrome)

Functionality and tools:

> **Screen readers**: Same result as the previous test (Firefox)

> **Notes function:** Notes function worked as expected.

> **Highlight function**: Same result as the previous test (Firefox)

> **Page navigation function**: Same result as the previous test (Firefox)

> **Zoom function:** Same result as the previous test (Firefox)

> **Full screen:** Same result as the previous test (Firefox)

> **Auto flip function:** Same result as the previous test (Firefox)

Testing results for the Pearson K-Science Textbook (Student Edition) (internet explorer)

Functionality and tools:

> **Screen readers**: Same result as the previous test (Google Chrome, Firefox)

> **Notes function:** This function did not work; the user is able to type the note, but cannot save it.

> **Highlight function**: Same result as a previous test (Google Chrome, Firefox)

> **Page navigation function:** All page navigation works, but sometimes the browser has trouble
loading the page.

> **Zoom function:** Same result as the previous test (Google Chrome, Firefox)

> **Full screen:** Same result as the previous test (Google Chrome, Firefox)

> **Auto flip function**: Same result as the previous test. (Google Chrome, Firefox)

Testing results for the Pearson K-Science Textbook (Student Edition) (Opera)

Functionality and tools:

> **Screen readers**: Same result as the previous test (Google Chrome, Firefox, Internet Explorer)

> **Notes function**: Same result as the previous test (Google Chrome)

> **Highlight function**: Same result as the previous test (Google Chrome, Firefox, Internet Explorer)

> **Page navigation function**: Same result as the previous test (Internet Explorer)

> **Zoom function:** Same result as the previous test (Google Chrome, Firefox, Internet Explorer)

> **Full screen:** Same result as the previous test (Google Chrome, Firefox, Internet Explorer)

> **Auto flip function**: Same result as the previous test (Google Chrome, Firefox, Internet Explorer)

Thoughts for improvements

Currently this content is not functional with screen readers, which greatly reduces the accessibility of this e-text. An alternate screen-reader-accessible format of the content should be made available.

Flash does have the capability to work with some screen readers but it must be properly configured. Please see information regarding accessibility at http://www.adobe.com/accessibility/products/flashplayer.html.

Reasoning Mind

When you first log onto the site you are presented with a navigation bar at the top of the screen. One of the sections under the main tab of the navigation bar is "Content Catalogs," which we reviewed and used as the basis for this report.

Not adhering to the third accessibility POUR Principle of Understandability, the navigation was somewhat challenging, because it took me some time to find the correct content. Once the user has located the content, the user is presented with two windows simultaneously on the screen. On the left side of the screen is a window with description of the content, and on the right side of the screen is the window where the content will be played. Some of the content took longer than expected to load, but once it did, the playback was fine.

Each Flash video is accompanied by good quality audio content. However, there are no advanced controls to adjust the speed of the narrator. This can be a problem for visually impaired students, who rely heavily on the audio function, since their screen readers cannot interact with Flash content.

Final thoughts

To improve accessibility, we recommend making adjustments to the navigation scheme to increase the ease of locating student materials. One possible solution is the names on the tabs to better indicate the purpose or content of each section. It will also aid navigation to make the navigation on the bottom of the screen more visible.

Scientific Minds Publishing

Scientific Minds Publishing's product has a simple navigation. For example, under the "scientific starters" tab are materials relevant to the student displayed on a single page. The student content consists of videos that include audio and image presentations. The audio is excellent, detailed in its descriptions of the information, and delivered by a narrator who speaks in a natural manner.

While videos with detailed and well-constructed content are useful, they are no substitute for a full digital textbook that is usable by a screen reader. However, no textbook material was available for testing

SciTex Learning, Biology (Student Edition/Lab Safety)

(Tested using Firefox 43.0.4, Google Chrome 47.0.2526.111, Internet Explorer 11.0.9600.18163, and Opera 34.0.2036.50)

Testing was conducted on a Windows 7 laptop. The latest version of Safari was not available for testing.

Below is a table showing the results and functions of the e-text and the browsers in which they were tested. For a more detailed description for each function in a specific browser, please see testing notes below.

Table Key

works as expected

works (but needs bug fixes or improvements)

did not work

	Firefox	Internet Explorer	Opera	Google Chrome
Screen Readers	✓	✓	～	～
Page Navigation	✓	✓	✓	✓
Search Box Function	✓	✓	✓	✓

Testing results for the SciTex Learning Biology (Student Edition/Lab Safety) (Firefox)

Functionality and tools:

Screen readers: The screen readers tested well in this content, primarily because one was built into the system.

Page navigation: Page navigation was intuitive and simple to understand.

Search box function: This function worked as expected (no crashes experienced).

Testing results for the SciTex Learning Biology (Student Edition/Lab Safety) (Internet Explorer)

Functionality and tools:

Screen readers: Same result as the previous test (Firefox)

Page navigation: Same result as the previous test (Firefox)

Search box function: Same result as the previous test (Firefox)

Testing results for the SciTex Learning Biology (Student Edition/Lab Safety) (Opera)

Functionality and tools:

Screen readers: Screen readers had problems in this browser. Screen reading did not work with ZoomText 10, but the screen reader built into the system worked fine.

Page navigation: Same result as the previous test (Firefox, Internet Explorer)

Search box function: Same result as the previous test (Firefox, Internet Explorer)

Testing results for the SciTex Learning Biology (Student Edition/Lab Safety) (Google Chrome)

Functionality and tools:

Screen readers: Same result as the previous test (Opera)

Page navigation: Same result as the previous test (Firefox, Internet Explorer, Opera)

Search box function: Same result as the previous test (Firefox, Internet Explorer, Opera)

Final thoughts

Although the functions of this product passed most of my testing, this module offered only a limited number of functions or tools for the test. The layout is very simple, which is good for ease of use, but it lacks functions that would help build a more accessible environment. For example, it would aid visually impaired students to have a textbook connected to the module and its interactive material.

Skylight Publishing

This website requires no username or password. In the place of an e-text, the website offers a collection of PDF textbooks broken into chapters. This material is usable with screen readers and is downloadable. This design is simple but effective. Many disabled students prefer textbooks in this format.

Texas State University Textbook

The textbooks use the standard PDF format, which is extremely easy for screen readers to work within the product. As such, most visually impaired individuals can make use of this format.

One drawback, however, is that the materials are presented to the student in one single file. For ease of navigation and use, we recommend that the textbook be split up by chapter into separate PDF files. This will allow users to more easily locate specific information in a chapter.

Lastly, the tagging in the PDF file for the placement of paragraphs may need to be double-checked for accuracy. Graphs and images are less accessible to visually impaired users.

TPS Publishing

The issues I experienced in TPS's product were quite different from those of the other publishers we tested.

No login is required, which is convenient, and the list of available content is very specific. However, much of the content runs on Flash, which limits accessibility for users with disabilities. Additionally, many images are out of focus, rendering the words in them unreadable.

For better accessibility to users with disabilities, we recommend providing images with much sharper resolution to enable reading the text in them. We also suggest steering away from Flash content to create a more accessible environment for users.

Urban Publishing

This product is distributed via Microsoft One Drive. My experience with this product was somewhat confusing because there was not much student material to be tested.

The student materials consist of PowerPoint lectures, which would be very useful with some slight adjustment. The main issue is that the PowerPoint content contains audio materials that overlap each other, making it difficult to understand.

Final Thoughts

Having content in the form of PowerPoint lectures with high-quality audio can be very effective, as long as the audio content is configured so that only one audio track is playing at any given time.

Zingy Publishing

The navigation scheme of this product is clear and simple, with the navigation bar conveniently located at the top of the webpage. However, most of the content the user can access from the navigation bar is not student material. The two tabs on the navigation bar that do contain student content are "quizzes" and "assignments." Once the user navigates to these two tabs, the user will find

two drop-down menus for class and the type of assignment. However, the menu does not indicate the subjects covered in these materials or with which class the materials are associated.

When the user launches the quiz content, the user is presented with multiple choice questions with only answer options but no content in the questions. The same type of experience applies to the section for assignments. Additionally, the tabs on the quiz and assignment pages seem to only provide functions to control settings and the overall use of the website, rather than to allow users to navigate to student content.

Final thoughts

Although navigation is simple and straightforward, in order to make the product useful to student users, the student content needs to be expanded and made more visible. Additionally, in our testing, the short answer assignments did not launch successfully, which needs to be addressed.

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Appendix B: WCAG 2.0 AA Testing Methodology

Our 3-step testing methodology works:

1. We used automated scanning/auditing software to crawl through the content on the pages of web applications, scanning each URL encountered against an extensive set of Section 508/WCAG rules (Accessibility Compliance Checkpoints) configured with the tool for Level AA. Any rule violations found in the pages were then organized into a number of categories, such as severity level, file, and rule violation. A detailed report was then generated. The software inspects and exposes issues that present potential risks to the usability and accessibility of web-based applications.

2. Screen-reading software was run against each page to discover accessibility issues with regard to navigation (tables, lists, forms, links), meaningful information and relationships of form controls and links, correct reading sequences, message reporting, and meaningful image content.

3. Finally, thorough manual testing was done to assess readability. This was done by rendering pages without associated style sheets, using high-contrast monitor settings as well as monochrome monitors, and reading in extra-large fonts. Additionally, keyboard navigability (no mouse or screen-reader) was examined closely to ensure all functions are keyboard accessible.

WCAG Guideline	Level	Testing Method Description (Manual or Automated)	Techniques for Passing
1.1 Text Alternatives: Provide text alternatives for any non-text content (Perceivable)			
1.1.1 Non-text Content	A	Automated: Examine the images and "alt" text contents.	• Every image element contains an alt attribute. • Decorative and spacer images have alt attribute="". • Alt attributes on images, graphs, maps contain text attributes that identify the destination of links, function of control, or brief but appropriate descriptions and location of detailed description for complex images.
1.2 Time-based Media: Provide alternatives for time-based media			
1.2.1 Audio-only and Video-only (Prerecorded)	A	Manual: Determine if audio descriptions are present and appropriate.	• All prerecorded audio-only media containing words includes a transcript. • All prerecorded video-only media includes a full text transcript of the video content.
1.2.2 Captions (Prerecorded)	A	Manual: Determine if captions are present and appropriate.	• Multimedia (audio/video) presentations include captions that are synchronized with the presentation.
1.2.3 Audio Description or Media Alternative (Prerecorded)	A	Manual: Determine if audio descriptions are present and appropriate.	• If the audio track cannot provide sufficient details for people who cannot see the video to understand all relevant important information, the multimedia presentation also includes a synchronized audio description.
1.2.4 Captions (Live)	AA	Manual: Determine if captions are present and appropriate.	• Captions are provided for all live audio content in synchronized media.
1.2.5 Audio Description (Prerecorded)	AA	Manual: Determine if audio descriptions are present and appropriate.	• Audio description is provided for all prerecorded video content in synchronized media.
1.3 Adaptable: Create content that can be presented in different ways (e.g., simpler layout) without losing information or structure			
1.3.1 Info and Relationships	A	Manual: 1. Turn off style sheets and verify whether the document it is still readable and logical. 2. Review text- only pages	• When stylesheets are turned off, no content is missing and reading order is logical. • For simple (non-nested) data tables, use the scope attribute to associate

WCAG Guideline	Level	Testing Method Description (Manual or Automated)	Techniques for Passing
		for consistency with the web pages. 3. Verify understandability of labels and instructions. <u>Automated</u>: 1. Evaluation for presence of column/row headers attributes of data tables. 2. Evaluate the presence of attributes for groupings of content (form controls, lists, fields) to ensure user has clear, logical understanding of the hierarchy of elements within a group.	header cells and data cells. • For complex data tables, use the id and headers attributes to associate data cells with header cells. • Text-based resources uses well-structured, standards-compliant HTML. • Use label elements to associate text with controls; use optgroup to group option elements inside a select; group form controls with fieldset and legend as appropriate to the content.
1.3.2 Meaningful Sequence	A	<u>Manual</u>: Test for logical reading order strictly using keyboard.	• Write HTML content in an order that is logical without styles or table layout. • Utilize the tab index attribute to sequence the logical order.
1.3.3 Sensory Characteristics	A	<u>Manual</u>: Check that the status of all controls and links can be understood and operated on, not solely based on shape, color, location, or sound.	• Ensure content contains additional information that allows the item to be located and identified without any knowledge of its shape, size, or relative position.
1.4 Distinguishable: Make it easier for users to see and hear content, including separating foreground from background			
1.4.1 Use of Color	A	<u>Manual</u>: Ensure that emphasis and instructions are not color-specific.	• Ensure instructions do not only rely on color to convey information. • Controls must use textual information to convey purpose.
1.4.2 Audio Control	A	<u>Manual</u>: Determine if sounds play automatically for longer than 3 seconds after loading page and if so that there are user audio controls present.	• Provide one of the following: - all sounds that play automatically stop in 3 seconds or less, or - a control that allows the user to turn off the sounds is provided near the beginning of the page, or - a way for a user to start sounds manually.

WCAG Guideline	Level	Testing Method Description (Manual or Automated)	Techniques for Passing
1.4.3 Contrast	**AA**	Manual: Evaluate content using grayscale video. Automated: Evaluate whether content's contrast is sufficient.	• Ensure luminosity contrast ratio exceeds 5:1 using the following formula or an automated tool. $(L1 + 0.05) / (L2 + 0.05)$, where - L1 is the relative luminance of the lighter of the foreground or background colors, and - L2 is the relative luminance of the darker of the foreground or background colors.
1.4.4 Resize text	**AA**	Manual: Examine readability with 200% zoom.	• Except for captions and images of text, ensure text can be resized without assistive technology up to 200 percent without loss of content or functionality.
1.4.5 Images of Text	**AA**	Manual: Inspect source code for use of CSS classes in images.	• Utilize CSS "class" to format the presentation of the content using strictly standard HTML elements of paragraphs, lists, headings, etc., for content structure.
		2.1 Keyboard Accessible: Make all functionality available from a keyboard	
2.1.1 Keyboard	**A**	Manual: Evaluate that all functionality can be accessed using only the keyboard.	• Use HTML form controls and links. • Provide keyboard-triggered event handlers. • Make keyboard actions accessible by using the onclick event for anchors and buttons.
2.1.2 No Keyboard Trap	**A**	Manual: Tab through content from start to finish, checking to see that keyboard focus is not trapped in any of the content. If trapped, check that help information is available explaining how to exit the content via the keyboard.	• Ensure that the keyboard function (usually tab) for advancing focus within content exits any subset of content when focus reaches the final navigation location in subset. • Provide a keyboard function to move the focus out of the content subset that user is trapped in and provide user with information on "how to escape" in documentation that is accessible.
		2.2 Enough Time: Provide users enough time to read and use content	
2.2.1 Timing Adjustable	**A**	Manual: Test by allowing a resource to remain inactive until developer-specified time-out occurs. Verify that	• Ensure user is notified of the time-out. • Ensure screen focus is placed on the notification when the time-out appears.

WCAG Guideline	Level	Testing Method Description (Manual or Automated)	Techniques for Passing
		the user is given the opportunity to extend the time.	• Provide user at least 30 seconds to request more time.
2.2.2 Pause, Stop, Hide	A	<u>Manual</u>: Test if blinking, moving, scrolling, or auto-updating content can be paused, and if so, whether such content can be restarted from the point it was paused or stopped.	• Use a control in the web page that stops moving, blinking, or auto-updating content.
2.3 Seizures: Do not design content in a way that is known to cause seizures			
2.3.1 Three Flashes or Below Threshold	A	<u>Manual</u>: Examine page to identify any flickering content.	• Provide control for user to disable flickering content. • Provide content that does not flicker with a frequency between 2 Hz and 55 Hz.
2.4 Navigable: Provide ways to help users navigate, find content, and determine where they are			
2.4.1 Bypass Blocks	A	<u>Manual</u>: Check web page for existence of skip links.	• A visible skip link is provided before any group of more than seven navigation links. • Tab order continues in an expected progression following the activation of a skip link.
2.4.2 Page Titled	A	<u>Manual</u>: Examine source code, checking that a non-empty title element appears in the head section and that the title element accurately describes the document.	• Provide a title element in the head section that defines the purpose of the document in a simple phrase.
2.4.3 Focus Order	A	<u>Manual</u>: Evaluate whether the tabbing-order of interactive elements follows the logical order presented by the content.	• Ensure interactive elements, such as links and form controls, are placed in the content so that the default tab order follows the sequences and relationships in the content.
2.4.4 Link Purpose (In Context)	A	<u>Manual</u>: Test that each link describes its purpose.	• Provide link text that describes the purpose of a link for anchor elements. • Provide text alternatives for the area elements of image maps.
2.4.5 Multiple Ways	AA	<u>Manual</u>: Test each link in the web page, verifying that the	• Provide the links to navigate to related web pages.

WCAG Guideline	Level	Testing Method Description (Manual or Automated)	Techniques for Passing
		link leads to related information.	
2.4.6 Headings and Labels	AA	Manual: Evaluate that each heading descriptively identifies the contents of its section.	• Specify headings that are descriptive as to what that heading's content is.
2.4.7 Focus Visible	AA	Manual: Using a keyboard, tab to each element, ensuring the background or border changes color, indicating focus, and then checking that the background or border change colors are removed when the element loses focus.	• Use CSS to change the presentation of a user interface component when it receives focus.
3.1 Readable: Make text content readable and understandable			
3.1.1 Language of Page	A	Manual: Examine the HTML element of the source code, ensuring the html element has a lang and/or xml:lang attribute and that it conforms to document "BCP 47: Tags for the Identification of Languages."	• Specify the lang attribute of the HTML element. • Ensure lang attribute conforms to "BCP 47: Tags for the Identification of Languages" (http://www.rfc-editor.org/rfc/bcp/bcp47.txt).
3.1.2 Language of Parts	AA	Manual: Examine source code: For each element in the document: - Check that the language of the content of the element is the same as the inherited language for the element as specified in HTML 4.01, "Inheritance of language codes." For each lang and xml:lang attribute in the document: - Check that the value of the attribute conforms to document "BCP 47: Tags for the Identification of Languages."	• The only allowed values for the lang and xml:lang attributes must conform to "BCP 47: Tags for the Identification of Languages" (http://www.rfc-editor.org/rfc/bcp/bcp47.txt).

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3.2 Predictable: Make Web pages appear and operate in predictable ways			
3.2.1 On Focus	**A**	Manual: Use keyboard to move focus through all content, checking if any focus change causes an automatic, unexpected change of the meaning of the content (e.g., popups, new screen, etc.)	• Use "activate" rather than "focus" as a trigger to ensure changes of context will be triggered only by a specific action on the part of the user (e.g., mouse click, press ENTER, etc.)
3.2.2 On Input	**A**	Manual: Examine that all forms have a Submit button or a description of what will happen on form input.	• Provide a Submit button (input type="submit", input type="image", or button type="submit"). • Provide instruction on the web page that precedes the interface element that causes change of context if activated by user.
3.2.3 Consistent Navigation	**AA**	Manual: Test by observing if repeated navigation links on different web pages appear in the same order.	• Ensure consistent placement of repeated controls (e.g., Search, Help, etc.) • Ensure consistent placement of repeated main menu navigation links.
3.2.4 Consistent Identification	**AA**	Manual: Check that each interface component (control, link, etc.) has associated text that identifies it and that this associated text is identical for each interface component with the same function.	• Ensure labels, names, and text alternatives are used consistently for content that has the same functionality.
3.3 Input Assistance: Help users avoid and correct mistakes			
3.3.1 Error Identification	**A**	Manual: Check that all forms that are required, or require an entry in specific data format or of certain values, alert user with meaningful error messages and instructions for correction if invalid data is entered.	• Provide text descriptions to identify required fields that were not completed. • Provide text descriptions when user input falls outside the required format or values. • Use ARIA role=alert or live regions to identify errors.
3.3.2 Labels or Instructions	**A**	Automated: Evaluate that all input elements have label elements, where the "for"	• Use label elements to associate text labels with form controls.

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		attribute of the label element matches the "id" of the input element.	
3.3.3 Error Suggestion	AA	Manual: Ensure that for all forms that fail under 3.3.1, instructions or suggestions for correction are provided, in addition to meaningful error messages.	• Provide text instructions or suggestions for how to correct errors in addition to the descriptions of the error as addressed in 3.3.1 techniques for passing.
3.3.4 Error Prevention (Legal, Financial, Data)	AA	Manual: 1. Identify any area that causes financial or legal transactions to occur and/or collects data from users in multiple steps. 2. Test that user is prompted to review and confirm data before submission of transaction or collected data.	• Ensure submissions are reversible. • Ensure data entered by user is checked for input errors and user is provided a chance to correct those errors. • Provide functionality for user to review, confirm, and correct information before submission.
4.1 Compatible: Maximize compatibility with current and future user agents, including assistive technologies			
4.1.1 Parsing (Well-Formed)	A	Automated: Evaluate each web page with a validating parser to determine the well-formedness of the code's syntax.	• Ensure elements have complete start and end tags. • Ensure elements are nested according to their specifications. • Ensure elements do not contain duplicate attributes and all IDs are unique, except where the specifications allow these features.
4.1.2 Name, Role, Value	A	Manual: Test functionality of form controls and links using the keyboard with and without assistive technology to make sure users clearly know the purposes of the controls and links.	• Ensure every active element works with keyboard controls. • Ensure that the purpose of active control is clear to both visual users and those using assistive technologies.

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