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DESIGNING FOR ACCESSIBILITY

FINAL PAPER

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Accessibility is such an important topic nowadays, especially when it comes to the online world. Although some professionals in the technical industry are aware of these standards, they still seem to be overlooked. Company guidelines, budget, and employee availability are a huge factor as well. Regardless of these factors, accessibility is important because there will always be individuals with lifelong and temporary disabilities or impairments. The focus on accessibility needs to be immensely improved upon, across all companies and in all countries. At Pearson, we are heading in the right direction by making accessibility more of a priority, but we do have room for improvements. The following are a few example pages, which have been evaluated based on the WCAG 2.1 POUR standards, discussing specific areas of possible improvement. These evaluations have also been based on the following defined user personas.

User Personas

Andrew Preston

Friendly **Clever**
Go-Getter

Age: 36
Work: Salesmen
Family: Single
Location: Denver, CO
Character: Adrenaline Junkie



"I feel like there's a smarter way for me to be able to navigate the online world."

Motivations

- Fear
- Power
- Social

Goals

- To cut down on unhealthy eating and drinking habits
- Get out on the motorcycle even more
- To be able to use the computer more easily for work and personal purposes

Frustrations

- Vision impairment from motorcycle accident
- Using his computer settings to magnify sites in order to read them
- Using VoiceOver on his laptop with sites that aren't compatible
- Cluttered sites with small text, moving items, or a lot of scrolling

Bio

Andrew is a salesmen for a medical company that sells prosthetic body parts to surgeons. Part of his job requires writing reports, send emails, using timesheets, and navigating company sites (including his company as well as hospital sites). He currently uses VoiceOver on his personal and company laptop. He is fairly tech savvy and enjoys browsing the internet, especially motorcycle sites, in his free time.



Personality

Introvert	Extrovert
Analytical	Creative
Loyal	Fickle
Passive	Active

Preferred Channels

Social Media	Medium
Mobile	High
Email	High
Traditional Ads	Low

Brands

Selena Martin

Age: 41
Work: Construction Manager
Family: Single
Location: Denver, CO
Character: The Fun Comedian



"The shorter the walk to the fridge... or to where I'm trying to get to online, the better!"

Motivations

Fear: [Progress bar]

Power: [Progress bar]

Social: [Progress bar]

Goals

- To be able to navigate online quicker with a keyboard
- To always make people laugh
- To help other amputees and people with disabilities

Frustrations

- Using a head wand instead of a mouse
- Sites that are not keyboard friendly
- Sites with too much navigation, ads, content
- Re-learning how to adjust to life without hands

Bio

Selena is a Construction Manager for a plumbing company. Besides managing the work crew, her daily tasks include getting online to order plumbing products, using timesheet systems, and using company email. She enjoys getting online for personal use to use Netflix and Zoom for friend meetings, given Covid-19 restrictions.

Personality

Introvert vs Extrovert: [Progress bar]

Analytical vs Creative: [Progress bar]

Loyal vs Fickle: [Progress bar]

Passive vs Active: [Progress bar]

Preferred Channels

Social Media: [Progress bar]

Mobile: [Progress bar]

Email: [Progress bar]

Traditional Ads: [Progress bar]

Brands



College Readiness & Completion Homepage Evaluation

Page URL

<https://www.pearson.com/us/higher-education/products-services-teaching/college-readiness-completion.html>

Andrew Preston's Experience – Visual impairment. Uses VoiceOver and computer zoom-in settings. Testing for Andrew will focus on VoiceOver use, zoom/magnification, color contrast, font, and spacing.

Selena Martin's Experience – Does not have the ability to use hands. Cannot use a mouse. Uses head wand with keyboard. Testing for Selena will focus on the use of keyboard navigation.

Perceivable

- **Text alternatives:** There are no image alt tags for Andrew's screen reader to identify on this page. Revisions would need to be made to this page to include alt tags on every image. When activating the Wave Evaluation Tool, the hero image and the blog section (Join the conversation) are not displaying image alt tags. These images are not reading as images, like the other images on the page. This could be an issue with the Wave Evaluation Tool. The map image (see Figure 1) and the Diversity Matters pictogram both display an alt role tag as `role=presentation`. There is not a proper image alt tag set-up in either case. The map image is especially problematic, given the image contains a significant amount of text and numbers within it. All of this information would be completely missed by screen readers.



Figure 1

- **Adaptable:** The headings are not in chronological order, making it confusing for Andrew to follow with the aid of the screen reader. The first heading at the top of the page is an H2. The second heading is reads as the left-side navigation top link, which is an H4. The third heading is an H1 (See Figure 2). The headers jumping around like this would make it confusing for Andrew's screen reader. Sadly, this is standard practice across many of Pearson's U.S. websites, with this type of header set-up. These templates could use major improvement here.



Figure 2

Blog is set-up using tables and seems to following the proper coding order.

When testing for Aria landmarks, they show only for the top navigation, a small section of the left-hand navigation, and the copyright at the footer of the page. In Wave, the details show that there are 261 references, so they are located throughout the code. Although, they are not showing up everywhere on the page view.

- **Distinguishable:** When zooming the page up to 200%, it reacts well. There is no horizontal scrolling. Links do not provide content on hover for button or text links. This should be implemented.

Color contrast for most of the page is acceptable. The one section that is troublesome, is the Diversity Matters illustration; more specifically, the lime green sections of each pictogram (see Figure 3). The lime green #D2DB0E with the blue #007FA3 did not pass AA or AAA standards, when using the Color Contrast Analyzer tool.

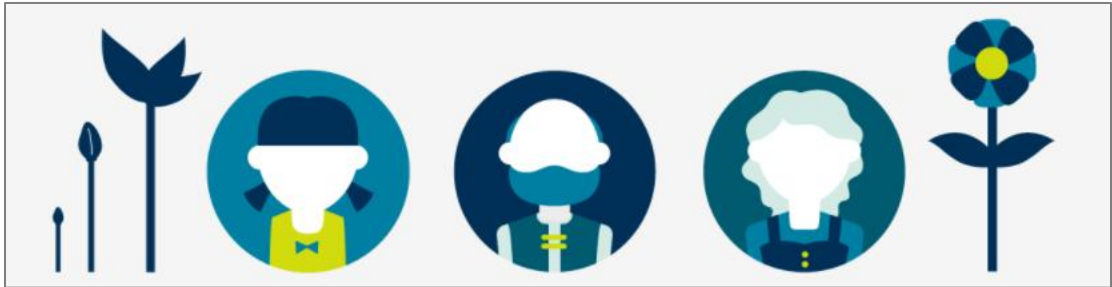


Figure 3

Lastly, the line height seems to be the same size as the font, not 1.5 times the font size, in order to make it pass accessibility. Andrew would struggle with these images as well as the font/spacing readability.

Operable

- **Keyboard accessible:** This page has severe issues with being keyboard accessible.

In Chrome, the only elements reading from the keyboard are the links, both button and text links.

In FireFox, the only things that are readable are the top country selector menu and the search bar. Then it jumps up to the URL bar and browser options.

In Safari, it does the same thing, but does not read the country selector menu. The only readable element is the search bar.

Major improvements are needed here in order for users, like Selena, to be able to navigate comfortably.

- **Navigable:** VoiceOver is also not functioning well on this page. Same result for the keyboard, it is only reading the links on the page. When testing in Chrome, the user must go through all of the browser bookmarks, widgets, and anything in the top bar – including the URL of the page. The use of this page is very complicated given the page read restrictions as well as being forced to navigate through all of the browsers features. The functionality of the page would provide navigation difficulties for Andrew's screen reader.

The links are very descriptive in text and read well.

There is a "Skip to main content" link that appears at the top of the page, when the page detects keyboard navigation. This will allow the user to bypass all top navigation. This would help Selena immensely.

The page offers multiple ways to navigate to it, including the side navigation and top breadcrumb links.

In Chrome and Safari, the links were also highlighted in blue boxes, so the indicator was visible. This was not the case in FireFox.

This page included one PDF link, which did not function when tabbing through or using a screen reader. PDF documents need to be tagged and reformatted for proper visibility.

Understandable

- **Readable:** VoiceOver detected the language, `html lang="en,"` with no issues. I tested the language by switching the country selector menu to "Netherlands." It opened a different page, so I could not test this page directly. However, it did read this new page in the proper language and read it fairly accurately. Interestingly, VoiceOver used a different voice for the Netherlands language.
- **Predictable:** When using the keyboard or VoiceOver, all page links opened the same in new windows with no issues. All side navigation links opened similarly to new pages within the site. All buttons and links received proper focus when navigated to (the rest of the page could not be tabbed through). The navigation, component functionality, and design are consistent across all three pages. In this way, the page is predictable for Andrew and Selena. With the majority of the content not being detectable, predictability would be low in this case.

Robust

- **Compatible:** There were no status messages to test on this page.

Transition to College Internal Page Evaluation

Page URL

<https://www.pearson.com/us/higher-education/products-services-teaching/college-readiness-completion/transition-to-college.html>

Andrew Preston's Experience – Visual impairment. Uses VoiceOver and computer zoom-in settings. Testing for Andrew will focus on VoiceOver use, zoom/magnification, color contrast, font, and spacing.

Selena Martin's Experience – Does not have the ability to use hands. Cannot use a mouse. Uses head wand with keyboard. Testing for Selena will focus on the use of keyboard navigation.

Perceivable

- **Text Alternatives:** For the one map image on this page, there is no alt image tag defined. Andrew's screen reader will not see this image.
- **Adaptable:** Headings are in chronological order up to H2. H3 is skipped and it goes to H4.

Table labels are set-up well by being located outside of each field. The table field labels remain visible while a user is typing. Table structure seems clear and in a logical order, however, autocomplete is not enabled. Enabling this would be especially beneficial in Selena's case, where typing is already time consuming.

Aria landmarks are showing only for the top navigation, a small amount of the left-hand navigation, each one of the state drop-downs, and the copyright at the footer of the page. In Wave, the details show that there are 278 references, so they are located throughout the code. Although, they are not showing up everywhere on the page view.

- **Distinguishable:** Text zooms in well up to 200%. The font increases properly and re-flows well. There is no horizontal scroll or content hovers. Content hovers should be implemented. The line spacing diminishes and crowds when zoomed into the headers. This makes things more difficult for Andrew to read.



Figure 4

Color contrast issues show with the map image (see Figure 4). The lime green (#D2DC25) against the light gray background (#F5F5F5) did not pass AA or AAA standards. It did, however, pass against the dark blue (#123157). The bits of green that line up with the gray background would be hard for Andrew to see properly.

Operable

- **Keyboard accessible:** In Chrome, this page struggles with keyboard navigation as well. After top navigation is tabbed through, the user is brought down to the “Request more information” button. All of the introduction text is skipped. Then it jumps over to the left-hand navigation. Afterwards, it again skips the text beside the map image. Once down in the state accordion section, tabbing through and opening/closing each accordion works properly. It does, however, skip the text within each accordion and goes to the button. Once down in the form section, it skips over the initial content and goes straight into the form fields. The form fields do navigate properly.

In FireFox, similar to the first page, the experience is much worse. When tabbing, the user navigates through the country selector menu, the search bar, and the form fields. Everything else is skipped over.

In Safari, tabbing navigates through the search bar, the form fields (except for the radio buttons), and then it jumps up to the URL bar in the browser.

Major improvements are needed here for Selena to be able to properly navigate through this page with a keyboard.

- **Navigable:** Similar to the keyboard experience, VoiceOver skips over a lot of content of this page. The same items as listed above, which included all headers and content on the page. Links, the accordion titles/buttons and table was readable, although the radio button questions within the table were not detected. Andrew’s screen reader would seriously struggle here.

If a user tabs from the URL bar, the “Skip to main content” link is displayed. Selena would have the same luxury on this page as on the previous page.

Each state accordion contains a button that is very non-descriptive by saying, “Learn more.” These need to be more descriptive in content (see Figure 5). Visually impaired individuals, like Andrew, would struggle with these buttons, especially if skipping around to each state quickly. Which button goes to which state would be confusing.

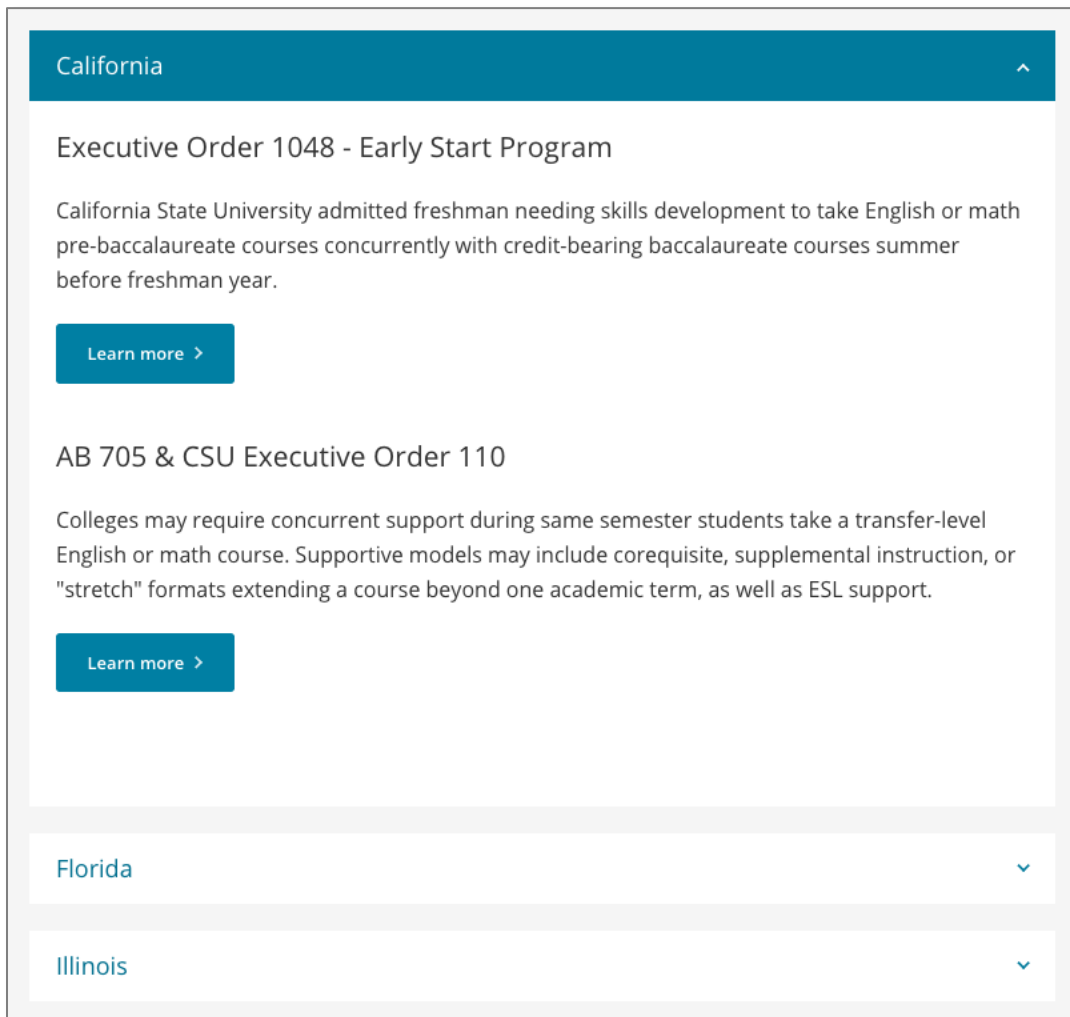


Figure 5

This page provides multiples ways to access it, such as the side navigation or the top breadcrumb links.

In Chrome and Safari, the links were also highlighted in blue boxes, so the indicator was visible. This was not the case in FireFox.

Understandable

- **Readable:** When using VoiceOver, it detected the language, `html lang="en,"` with no issues. I tested the language by switching the country selector menu to "Netherlands." It opened a new page, so I could not test this page directly. However, it did read this new page in the proper language and read it fairly accurately. Interestingly, VoiceOver used a different voice for the Netherlands language.
- **Predictable:** When using the keyboard, the form does submit when all fields are properly filled out and the submit button is selected. Each of the fields receive proper focus when tabbing through. VoiceOver reads each of the form fields properly, minus the radio button questions. New windows do open when "Learn more" links are selected. Navigation, component functionality, and design are consistent across all three pages. In these ways, the page would be predictable for Andrew and Selena. With most of the content not being detectable, this page's predictability score would be low.
- **Input Assistance:** Form error identification and labels were consistent. Although, there were detection errors when using the keyboard or VoiceOver, when it came to the radio button questions/labels and the error messages themselves (see Figure 6).

This field is required

Zip Code *

This field is required

What is your purchasing timeframe? *

This field is required

Are you the purchasing decision maker? *

Yes

No

This field is required

Do you have funding for a purchase? *

This field is required

Please tell us the names of the high school(s) you will be working with. *

Figure 6

Robust

- **Compatible:** As mentioned above, when receiving form error messages, keyboard navigation and VoiceOver both do not read any of these error messages. Selena could at least read the error messages and navigate to each field to input something to correct the error. Andrew, however, would have a hard time reading these messages and could get very confused as to what is wrong with the form and where he needs to make corrections.

Dual Enrollment Programs Internal Page Evaluation

(High volume page, recently redesigned to combine multiple pages into one.)

Page URL

<https://www.pearson.com/us/higher-education/products-services-teaching/college-readiness-completion/dual-enrollment-programs.html>

Andrew Preston’s Experience – Visual impairment. Uses VoiceOver and computer zoom-in settings. Testing for Andrew will focus on VoiceOver use, zoom/magnification, color contrast, font, and spacing.

Selena Martin’s Experience – Does not have the ability to use hands. Cannot use a mouse. Uses head wand with keyboard. Testing for Selena will focus on the use of keyboard navigation.

Perceivable

- **Text Alternatives:** All images are missing alt image tags, except for the logos underneath the “Pearson partners” section (see Figure 7). A screen reader, such as Andrew’s, will only detect the logos. All other images are invisible to a screen reader.

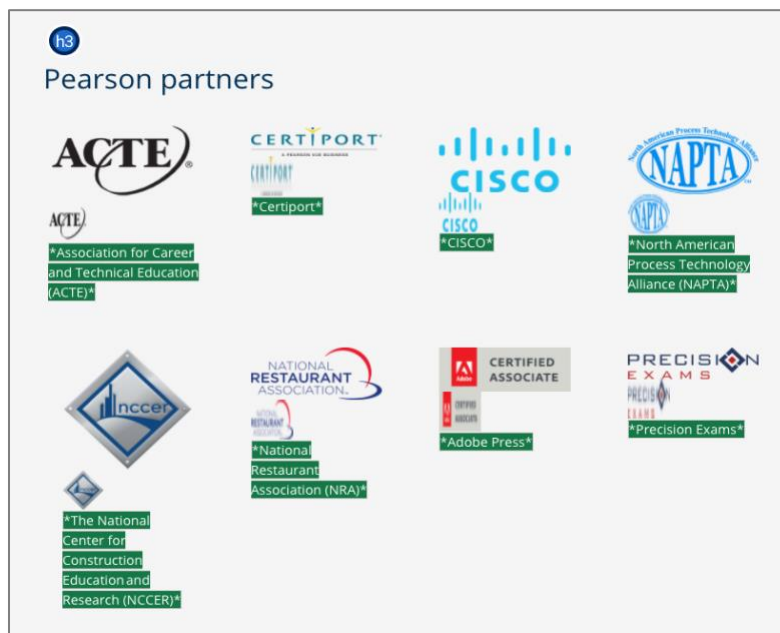


Figure 7

- **Adaptable:** The headings were used most properly on this page, minus the H6 heading in the first section. A major reason for this is because this page uses a different template than the previous two pages. It has no left-hand navigation, so that helps with proper ordering of the page headers.

Aria landmarks show only for the top navigation, the “Contact us” drop-down, and the copyright at the footer of the page. In Wave, the details show that there are 291 references, they are throughout the code, but most of these instances are not showing when viewing the page view.

- **Distinguishable:** Like on the previous two pages, the zoom up to 200% functions rather well. A tad more text line spacing would be beneficial. Even the pop-up boxes/modal windows zoom well. There is no horizontal scroll.

Again, no content on hover over for this page. Content on hover should be implemented across the page.

Color contrast issues are present when it comes to some of the logos and pictograms across the page. For example, the CISCO logo is a clear violator. Its blue #1BBEED on a light gray #F5F5F5 background does not pass AA or AAA standards (see Figure 9 and Figure 11). For the NAPTA logo, #008BEF on the light gray background, it doesn’t pass all fields (see Figure 9 and Figure 12). It does, however, pass for AA standards for large text and non-text contrast. It does not pass AAA standards at all. Regarding the pictograms, the greens have a hard time passing. The woman for “Retrieval practice” wearing the green shirt, #008638 green on #D4EAE light blue, does not pass any standards (see Figure 8 and Figure 10). The two variations of green have a hard time passing on all of these pictograms, especially when the green sections are small or on lighter backgrounds. Andrew would have a hard time seeing these sections.

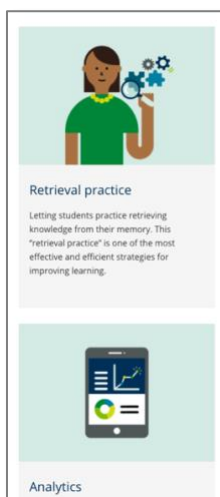


Figure 8

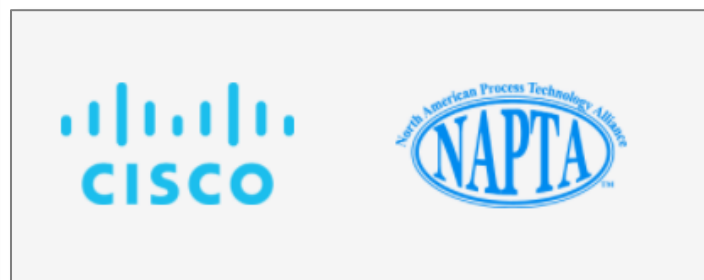


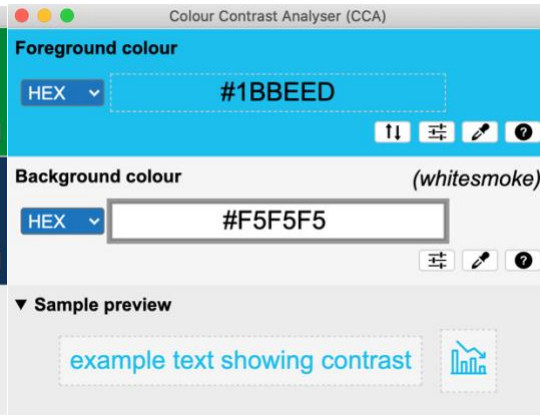
Figure 9



WCAG 2.1 results Contrast ratio 2.8:1

- ▶ 1.4.3 Contrast (Minimum) (AA)
 - ✗ Fail (regular text) ✗ Fail (large text)
- ▶ 1.4.6 Contrast (Enhanced) (AAA)
 - ✗ Fail (regular text) ✗ Fail (large text)
- ▶ 1.4.11 Non-text Contrast (AA)
 - ✗ Fail (UI components and graphical objects)

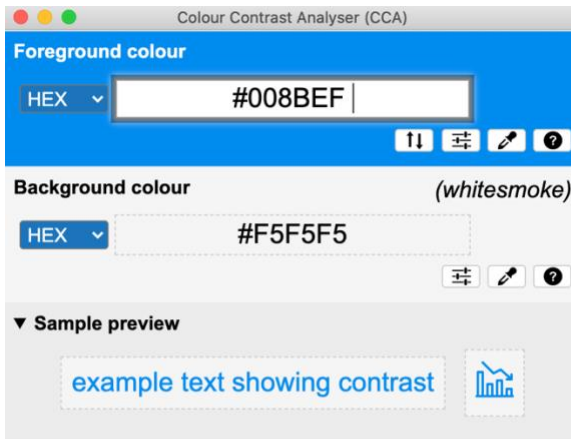
Figure 10



WCAG 2.1 results Contrast ratio 2:1

- ▶ 1.4.3 Contrast (Minimum) (AA)
 - ✗ Fail (regular text) ✗ Fail (large text)
- ▶ 1.4.6 Contrast (Enhanced) (AAA)
 - ✗ Fail (regular text) ✗ Fail (large text)
- ▶ 1.4.11 Non-text Contrast (AA)
 - ✗ Fail (UI components and graphical objects)

Figure 11



WCAG 2.1 results Contrast ratio 3.2:1

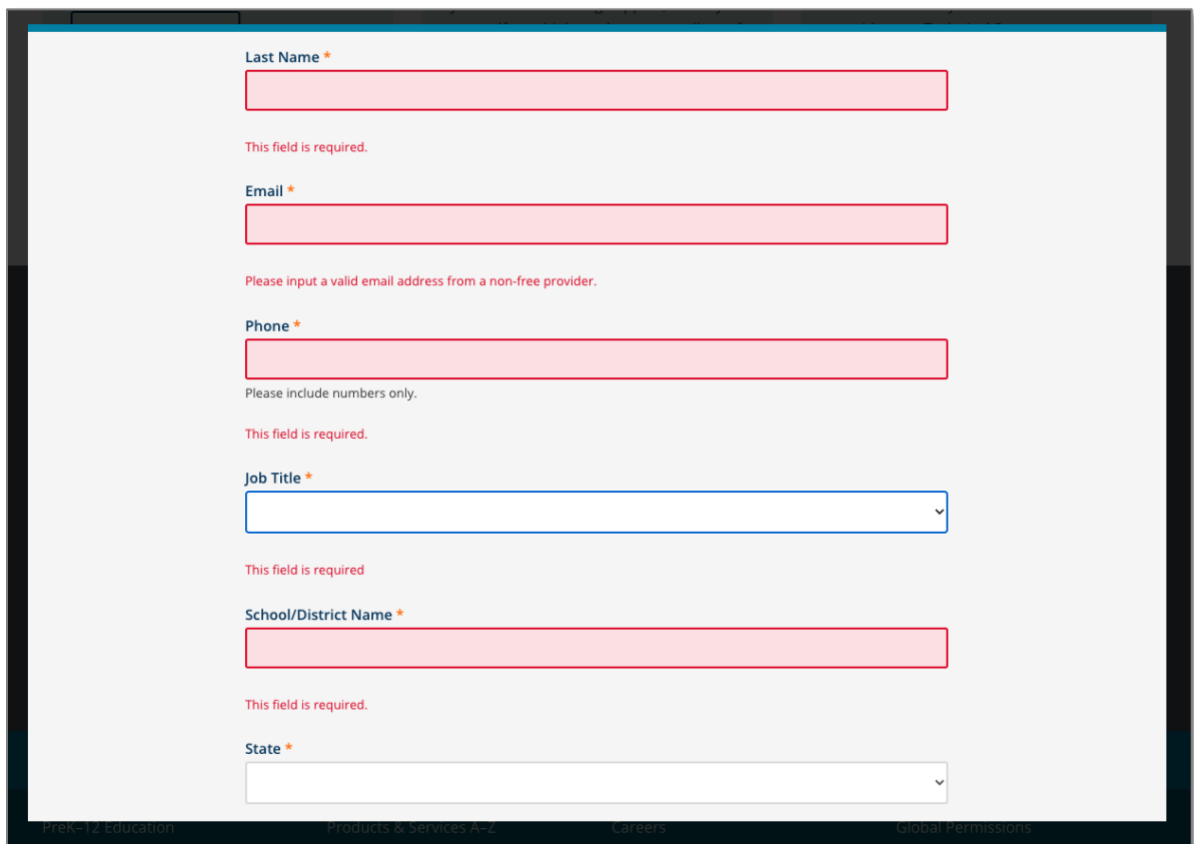
- ▶ 1.4.3 Contrast (Minimum) (AA)
 - ✗ Fail (regular text) ✓ Pass (large text)
- ▶ 1.4.6 Contrast (Enhanced) (AAA)
 - ✗ Fail (regular text) ✗ Fail (large text)
- ▶ 1.4.11 Non-text Contrast (AA)
 - ✓ Pass (UI components and graphical objects)

Figure 12

Operable

- **Keyboard accessible:** In Chrome, keyboard tabbing only navigates through the text links and buttons. It skips over all content on the page. Anchor link buttons work, but there is no way to get back to the top of the page, unless a user navigates through the rest of the page. When accessing the modal window form, a user can escape out of the modal (X box in top right hand corner) only after navigating through all of the fields in the form. A user can tab through the form fields, but the “What is your purchasing timeframe” drop-down, or any of the other drop-down fields, do not open. It automatically displays errors in all fields. Then, if a user tries to do it again, it reloads the modal box instead (see Figure 13). This same thing happens in all pop-up windows across the page.

FireFox and Safari are considerably worse by only reading the country selector menu and search bar, like the other pages. The page would not work well for Selena. She would skip most of the page, run into frustration with the anchor links by being stuck in sections, and would not be able to properly fill out or close out of modal window forms.



The image shows a screenshot of a web form with several input fields and error messages. The form is titled "Last Name *" and "Email *" and "Phone *" and "Job Title *" and "School/District Name *" and "State *". The "Last Name" field has a red border and a red error message "This field is required." below it. The "Email" field has a red border and a red error message "Please input a valid email address from a non-free provider." below it. The "Phone" field has a red border and a red error message "Please include numbers only." below it. The "Job Title" field is a dropdown menu with a blue border and a red error message "This field is required" below it. The "School/District Name" field has a red border and a red error message "This field is required." below it. The "State" field is a dropdown menu with a white border and a red error message "This field is required." below it. At the bottom of the form, there are four navigation links: "PreK-12 Education", "Products & Services A-C", "Careers", and "Global Permissions".

Figure 13

- **Navigable:** In Chrome, VoiceOver, similar to the previous two pages, skips over all content, minus button and text links. Interestingly enough, this page also has image links, unlike the previous two pages, but these links are skipped over as well. The images take precedence here; only text and button links are detected. With the majority of the page being skipped, this page would be particularly difficult for Andrew to navigate with a screen reader.

Firefox and Safari are considerably worse by only reading the country selector menu and search bar, like the other pages.

Like the previous pages, there is a “Skip to main content” link option at the top of the page, after navigating off of the URL bar. Users, like Selena, can easily bypass the top navigation (see Figure 14).

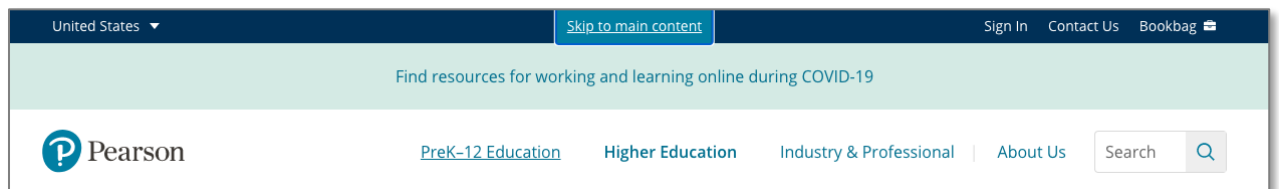


Figure 14

Pop-ups/modal windows are located on a few of the text links. VoiceOver does read these; they open/close properly and can be tabbed through. Similar to other forms, the radio button question/label is not detected by VoiceOver.

Similar to keyboard tabbing, VoiceOver and anchor links are problematic on this page (see Figure 15). They function properly (they are read and a user can select them), but once a user gets down the page, getting back to the top is difficult. There is a top circle icon in the lower right-hand corner of the page, which links a user back to the top, but VoiceOver does not detect it (see Figure 16). Also, because this page does not have the usual left-hand navigation and has anchor links instead, getting to other pages within this part of the site is not intuitive. Navigating elsewhere within this section of the website is not user friendly. Andrew's screen reader would severely struggle with this type of functionality.

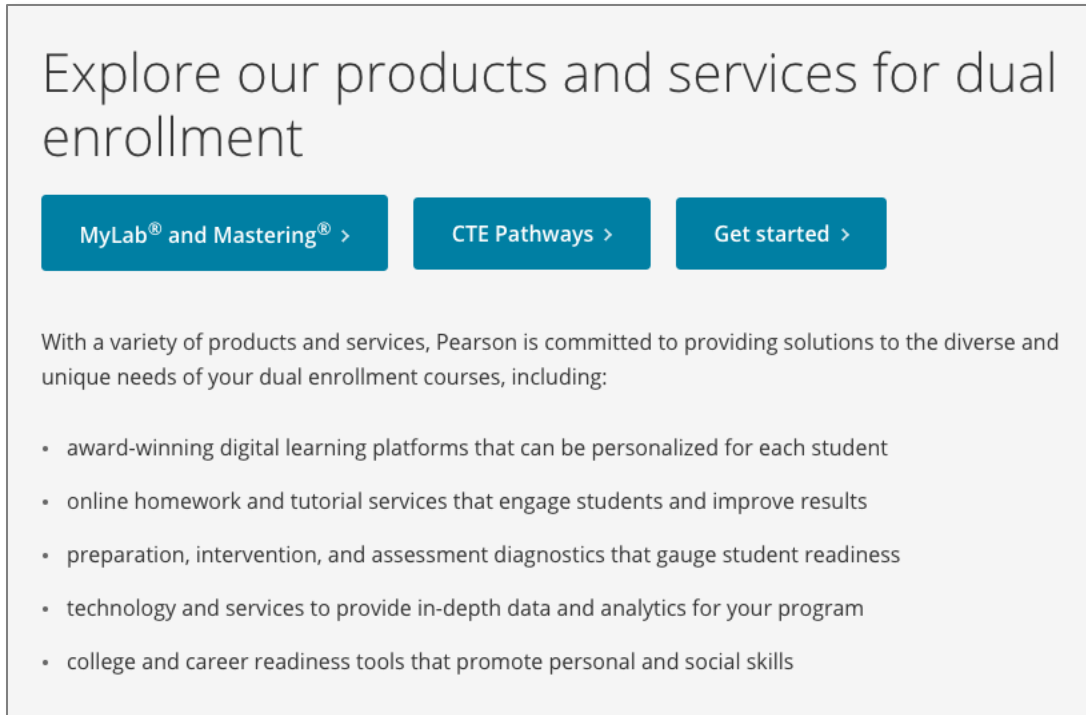


Figure 15

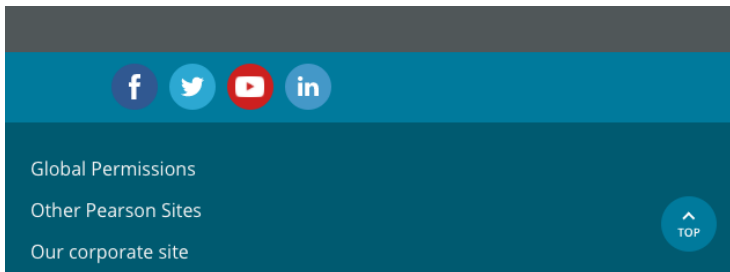


Figure 16

Text and button links throughout the page do a good job of being descriptive.

There are several links that navigate to PDFs, which do not function when tabbing through or using a screen reader. All PDF documents need to be tagged and reformatted for proper visibility.

Understandable

- **Readable:** VoiceOver detected the language, `html lang="en,"` with no issues. I tested the language by switching the country selector menu to "Netherlands." It opened a new page, so I could not test this page directly. However, it did read this new page in the proper language and read it fairly accurately. Interestingly, VoiceOver used a different voice for the Netherlands language.

- **Predictable:** All links/buttons receive proper focus when navigated to. Same thing for all form fields. The modal windows open properly and close buttons receives focus, after navigating through all modal window content.

Navigation on this page is different from other pages within this website. This inconsistency could be confusing for both Selena and Andrew, which takes down it's predictability score.

Similar components follow the same design and functionality across the page as well as match the previous two pages.

- **Input Assistance:** The modal/pop-up window form labels are all consistent, including the error messages. They follow the same design and functionality. The issue lies within the drop down menu functionality and radio button questions/labels, as mentioned previously. Issues among form input assistance are the same across all 3 of these pages. This is most likely because Pearson uses an external program, Pardot, to create all embedded forms across our websites.

Robust

Compatible: The modal/pop-up window forms are mainly read properly by a screen reader and keyboard for reading most fields (minus radio button labels and drop-down menus). As mentioned above, when receiving form error messages, keyboard navigation and VoiceOver both do not read any of these error messages. For modal windows that are not forms (“Learn more about the CTE Pathways specific products we have to support your district or school’s needs.” - Link on middle section of the page.), similar to regular page content, all content is skipped minus buttons/text links (see Figure 17). Again, these issues seem to be the same issues across all modal windows on all pages.

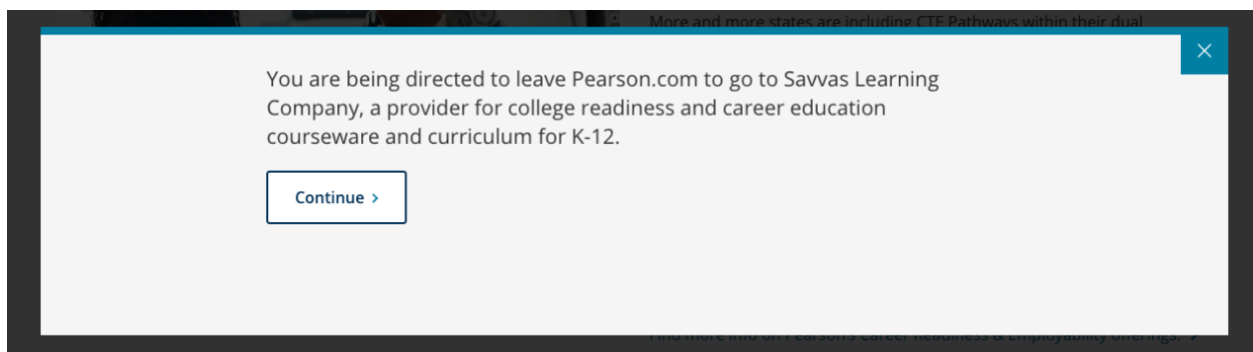


Figure 17

In conclusion, after testing all three pages using WCAG 2.1 POUR Standards, VoiceOver, Color Contrast Analyzer (CCA), and the Wave Accessibility Evaluation Tool, several improvements will enhance the overall accessibility. All three pages show a severe lack in the ability to navigate by keyboard and screen reader, when tested in Chrome, FireFox, and Safari. Lessons learned for these pages include avoiding skipping header levels, verifying that all images contain alt image tags, image color enhancements for better color contrast, increase font line spacing, form error message detection improvement, form radio button and drop-down menu improvement, modal window improvements (especially with forms), implementation of form autocomplete, and major overall improvements of content and image detection by screen readers and keyboards. Users, like Selena and Andrew, that have visual or physical impairments would immensely struggle with using these three pages. Additionally, given the struggles visually and physically impaired users would clearly experience on these pages, it is obvious that those with cognitive issues would also come across several obstacles. Pearson contains several high-visibility websites across many countries, therefore, including these types of improvements to better align with AA standards is extremely important and should be highly considered moving forward.