# Authoring for accessibility

Note: The behavior of screen readers described in this document is based primarily on NVDA. Voiceover may behave better in some situations, but we need to be sure to accommodate NVDA users as it is the most widely used screen reader.

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## Support for screen readers--what and when

Providing a good experience for screen reader users requires special formatting and editing in five areas:

|  |  |  |
| --- | --- | --- |
| **Type of support** | **What it is** | **When to do it** |
| Basic content authoring practices | Simple and systematic edits described below | As you author the content. |
| Editorial annotations | Intended to fill in the gaps for screen reader users in cases when the presentation is relying on the user being able to see the text, or on seeing a visual device such as highlighting. | After the Overview content is finalized and before it is copied for Try it 1.  Worst case: Try it 1 before it is copied to make Try it 2 and 3. |
| Alt text for embedded images (images that appear within a JUICE step) | This is text added to an image’s properties. It is automatically read by the screen reader. By default, every image has an alt text of “”, which is read as “blank.” Images that convey pedagogical content should have their alt text updated to describe the information they are conveying.  If an image requires a lengthy description, this should be added as an html file and accessed via a “view as text” link that appears underneath the image. | Image alt text should be added to images after the Overview and Try its are finalized.  Note: When you replace an image, the alt text is not preserved and must be recreated. |
| **Type of support** | **What it is** | **When to do it** |
| Accessible versions of Picture its | Some Picture its can be presented using an image with alt text in an html template. No additional accessible support is required for these.  Most Picture its are presented as pdfs, and are likely to contain visual information that cannot be read by a screen reader. If this is the case, then you should provide a text description of the Picture it as an html file that is accessed via an accessible icon following the visual Picture it link. | After content is final |
| Screen reader friendly structure for ancillary text documents | Text documents that are created in Word and saved as pdfs should be formatted with H1, H2, H3 document styles so that they support screen reader navigation. Any images should have alt text added as a property of the image--in Word, right click an image to add alt text. | Do this as the document as being created! |

## 

## Tools to support screen reader authoring

The JUICE Overview and Try it content editors have three tools that are useful for making accessible authoring tweaks:

1. Screen reader only text style

Text that is set to this style will not display on screen, but it will be read by a screen reader. Use this for adding hidden punctuation, link target information, and annotations to provide explanations of highlighting or other content that relies on a visual presentation.

The space taken by the screen reader text will be completely ignored--and it can even be used to insert phrases into existing sentences without disrupting the spacing.

1. Screen reader blank text style

This is used when the visual presentation is using underscores to represent blanks. For example, There are three \_\_\_\_\_\_\_\_\_ mice.

To make a screen reader read this as “blank”, highlight the blanks, and choose the Screen reader blank style. This works for any width blank.

Careful! Do not select blanks and set the style in pieces--this can confuse the screen reader. If you do not select the whole blank, remove the style and try again.

1. Shift + SPACEBAR

This inserts an explicit &nbsp; into the editor instead of just a plain blank space.

There are a number of situations where screen readers will behave badly and try to read punctuation aloud or run screen reader text together with visual text to create weird words. Most of these can be addressed by adding an &nbsp; in place of a regular blank space.

## Basic content practices for screen reader support

Ensuring a good experience for screen readers requires some special formatting for Overview and Try it content.

See this Overview for examples and formatting notes:

https://dev.juiceyourskills.com/juice/modulette/D3.4.Authoring%20for%20screen%20readers/refresher/1

### Answer blanks

1. If your text uses underscores to represent answer blanks, you must use the screen reader answer blank style for them.
   1. Type in the number of underscores that you want in your blank
   2. Select them
   3. Choose the screen reader anwer blank style. Screen reader blanks will be highlighted in blue in the editor. This is a \_\_\_\_\_\_\_.

Careful! Do not select blanks and set the style in pieces--this can confuse the screen reader. If you do not select the whole blank, remove the style and try again.

1. If the text is within a multiple choice answer object, you must use html syntax for the blank:

<span aria-hidden = 'true'>\_\_\_\_\_\_\_\_</span><span class='screen-reader-only'>,&nbsp;blank&nbsp;,</span>.

Copy and paste this exact text into the prompt area of the multiple choice where you want the blank to be.

### Tables

1. Tables should NOT use captions--these are read multiple times by NVDA and can be confusing.
2. Tables with column headers SHOULD have the Header set to the First Row. This causes NVDA to re-read the column header before each cell and helps the user keep track of the information in the table.
3. Tables that use ju-powertip or ju-summary (Ask yourself, Did you know, and Summary tables) are not read as tables by design. If the title in the first row does not end with punctuation, you must add a comma to pause the screen reader before it reads the rest of the table. Do this as follows:
   1. Position your cursor at the end of the table row text
   2. Type Shift + SPACEBAR to add an &nbsp; character
   3. Type a comma
   4. Type a space
   5. Highlight the space and comma
   6. Choose “screen reader only” from the style menu.

### Partial words

Screen readers will try to make anything into a word. If you are presenting a partial word, such as “use -ed to form the past tense,” then put spaces between the letters: “use -e d to form the past tense.”

Watch for this when the letter S used as a variable in Math. For example, 4S is read as “fours.” In this case, add a screen reader only space between the 4 and the S.

1. Position your cursor between the 4 and the S and type a space character
2. Highlight it
3. Choose “screen reader only” from the style menu.

### Math authoring for screen readers

You must use MathJAX for a multiplication x or a subtraction hyphen for a screen reader to read them properly.

Put periods inside of a MathJAX expression so they are not read as “dot”:

The answer is `6/7.`

Note: Voiceover will read “period” at the end of this expression regardless of whether or not the period is inside of MathJAX. There doesn’t seem to be a way to prevent this.

Parentheses in plain text are skipped by screen readers, but they are read as multiplication if they are part of a MathJAX expression.

If you want to use plain text for an expression like this 3(4), add a screen reader only times:

3 times (4).

(see below for more on screen reader only authoring).

The variable A is read as a short “a” so put it inside MathJAX if you want it to read properly:

`”A” = 3 xx 4`

Do not use &nbsp; spaces inside of full MathJAX expressions. This will cause Voiceover to read a space. Use regular spaces, or no spaces at all, and MathJAX will render them automatically.  
  
 `”A” =&npsp;3 xx 4` read as “A equals space 3 times 4”

If you try to use MathJAX for an operator symbol on its own, you must add extra &nbsp; to the right of the symbol to have proper spacing between the symbol and the next character to its right:

3 x 4: 3 `xx&nbsp;&nbsp;`&nbsp;&nbsp; 4

4 - 4: 4 `-&nbsp;&nbsp;`&nbsp;&nbsp; 4

If your MathJax is not converting, check for these. It will not work if:

* the text is bold or italicized
* the text has an en or em dash instead of a hyphen
* the characters are in different <span> tags.

### Links--Making sure they are recognized as links

1. Links are recognized by the screen reader and should be announced as links. This does not work if the links have extraneous formatting:
   1. Do not bold or underline links
   2. Do not include the picture it icon as part of a Picture it link.
   3. Do not create the link in pieces. If you do not capture all the text you want in the link text when you are creating the link, remove the link and try again.
2. Note: There used to be an issue with links inside tables or in steps with images, tables, or lists not announcing themselves as links when the screen reader is reading the step. If you experience this,
   1. position your cursor at the end of the link
   2. Type Shift + SPACEBAR to add an &nbsp; character outside the end of the link.

### Links--Making sure that users don’t get lost

When a user opens a link, the screen reader focus will shift to the link target page and start reading it. If screen reader users do not know what happened or where they are, they will find it impossible to return to where they were when they opened the link.

For this reason, **EVERY LINK** must tell the user how it will open. JUICE links are generally expected to open in a new window. Screen reader versions of Picture its are expected to open in a new tab.

1. **Links with the Picture it icon**. Picture it links should be preceded by the Picture it icon. Any link with a Picture it icon will say where it opens automatically. The screen reader will say “Visual resource, opens in a new window.” No action is required by the author other than adding the Picture it icon before the link.
2. **Links without the Picture it icon.** You must add screen reader only text to these links to say where they open:
   1. Create the link as [link name] (opens in a new window)
   2. Select the space and the text in parentheses that follows the link name
   3. Choose Screen reader only from the Styles menu. This will hide the link from the visual display.

To add this information to an existing link:

1. Put your cursor at the end of the link.
2. Type Shift + SPACEBAR
3. Type this text: (opens in a new window)
4. Highlight the space and the text in parentheses
5. Choose “screen reader only” from the style menu.

### Try it information box

If you are presenting information in the floating Try it information box that is necessary for answering Try it questions, add screen reader only text to the first step of the Try it that says the following:

Note for screen readers: Press Alt + 1 , or option + 1 on Mac, to open the try it information box in a new window and access information needed to answer some of the questions. In the content, this needed information is described as being in the box or table to the right.

Add this text after the last visible text in the left pane of the first step of the Try it. After you add it, select it and choose “screen reader only” from the style menu.

## Editorial annotations for screen readers

See this Overview for examples of annotations and some formatting notes:

https://dev.juiceyourskills.com/juice/modulette/D3.4.Authoring%20for%20screen%20readers/refresher/1

If the content presentation relies on elements that the user can see, such as punctuation, spelling, or highlighting, then you should add “screen reader only” annotations to make the meaning of the content clear to a screen reader user.

Text and spaces marked with the “screen reader only” style are hidden from the visual display, but they are part of the source text for the page, and the source text is the text that is read by the screen reader.

### Annotating Overview or Try it step content

Add screen reader text to a step in the editor as follows:

1. Type the text in the desired location using the punctuation and spacing you would want if the text were visible.
2. Select the text and any spaces that should be hidden. For NVDA, leave a visual space after a period and before the screen reader only text or the period will be read as “dot.”
3. Choose “screen reader only” from the Styles menu. Screen reader only text is highlighted in red in the editor.

This is visual text. This is screen reader text. This is visual text.

This is visual text comma, and the word comma is screen reader text.

The space that is taken by screen reader only text will be ignored in the visual display. This includes the line space as well as character spaces. Screen reader text can be inserted anywhere--between characters in a word, between words, sentences, or at the end of a paragraph.  
  
If you find that the screen reader is trying to run the visual text in with the screen reader text and create odd sounding words, or is reading punctuation aloud, try replacing blank spaces before or after the screen reader text with explicit &nbsp; characters using Shift + SPACEBAR.

Careful! Do not set text to screen reader only in pieces--this will confuse the screen reader. If you want to change what you have set to screen reader only, then clear the formatting and start over.

### Annotating Try it interactions

The Styles menu is not available when you are editing an interaction. To add screen reader text to an interaction, you must use html that includes the style information. Copy and paste this text into the interaction and add the hidden text:

<span class="screen-reader-only" > hidden text goes here </span>

### Examples of when to annotate

Here are a few of the most common uses for editorial annotations:

1. Highlighting

Highlighting usually points out something special about the highlighted text and in most cases will need some kind of annotation.

When you are annotating highlighting, do not simply state that certain text is highlighted. Instead, ask yourself what the purpose of the highlighting is, and annotate accordingly.

* Sometimes highlighting is not really conveying additional information. In this case, don’t annotate it.
* If the highlighting is used to point out a specific phrase in a longer piece of writing in the right panel, it may make sense to put an annotation that includes the phrase in the left panel
* You don’t need to put the annotations in the same location as the highlighting. You simply need to make the meaning of the highlighting clear somewhere in the step in which it occurs.

1. Punctuation

Screen readers have settings that read punctuation aloud, but it’s not the best experience for a user. If you are presenting material that requires the student to know exactly how it is punctuated, annotate the punctuation. This includes parentheses and quotation marks.

In general, put the punctuation annotation before the visual punctuation. One exception is if you are annotating a period at the end of a sentence with no following sentence. To avoid the closing period being read as “dot,” the annotation may need to come after the visual period.

1. Spelling and capitalization

If you are presenting material that describes spelling or capitalization, then use screen reader only text to spell out the words. Add the spelling with spaces between the letters after the word, and follow the spelling with a comma:

cats c a t s, is the plural of cat

You can also add “spelled blah” When you do this, you should put a comma in the screen reader only text before spelled:

cats, spelled c a t s, is the plural of cat

Identify capitalized words at the end of the sentence:

I took Grandmother to the store. Grandmother is capitalized. We bought 20 lbs of potatoes.

4. Odd word pronunciations--DO NOT CORRECT

Screen readers make educated guesses about how to pronounce words like read and read, live and live, or Bridalveil. They may not guess correctly for the particular context you are using the word in. DO NOT try to correct this! It is confusing to a screen reader user to experience corrected words in one source, but not in another source.

## Alt text for embedded images

Image alt text is text that is part of an image’s properties, and it is automatically read by the screen reader. By default, any images added in the editor have an alt text string of “”, which is the same as “blank.” Images should be updated to have non-blank alt text in two cases:

1. The image is presenting important information to the user.

In this case, the blank alt text should be replaced by text that conveys the information that the image is conveying.

If the information is too lengthy, the alt text should convey a brief description of the image, and you should add a “view as text” link to an html description of the image underneath the image. See below for more information:

1. The image is decorative, but is by itself in a step,which causes the screen reader to read the blank alt text as “blank.” In this case, add a very brief description of what the image is.

You do not need non-blank alt text for images that are with other text or images in a step and do not convey pedagogical meaning. In this case, the screen reader will simply ignore the image with the non-blank alt text.

See this document for detailed information on how to compose effective and helpful alt text:

<https://docs.google.com/spreadsheets/d/1fwk0rCfcXrzavE6ODzeMdlHQCzrQQYO_zQi96qV6uu8/edit#gid=1550003003>

To update an image’s alt text, do the following:

1. In the editor, select the image or right click on it.
2. Choose Image Properties, add the alt text to the “Alternative Text” box and click OK.

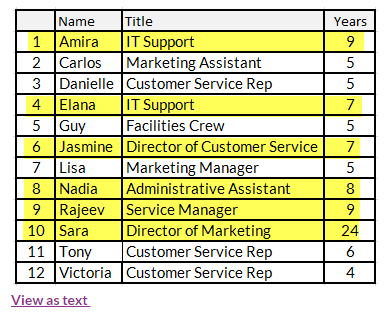
### Tips for composing effect and helpful alt text

|  |  |
| --- | --- |
| **links to accessibility style resources** | <http://accessibility.psu.edu/images/imageshtml/> |
|  | <http://webaim.org/techniques/alttext/> |
|  | <http://diagramcenter.org/table-of-contents-2.html> |
|  | <https://www.w3.org/TR/WCAG20-TECHS/G73> |
| **When to tag and when not** | Do not add a tag if the image is not conveying any new information that is not already in the same step on the page. However, if the image is alone in its panel, add a very brief alt tag so that the screen reader will not read as "blank" |
| **Referencing the image** | Never start the alt tag with "Image of" or "Graphic of." These descriptions do not convey any additional meaning. Instead use "Illustration, diagram, map, graph, chart, painting, plan, photograph, timeline, schematic" etc. |
|  | Specify an image as a diagram or illustration etc. ONLY when knowing this helps the listener makes sense of what he or she is hearing. If the information that the image is conveying can be read smoothly in the flow of the other text in the step, just present the information without saying it is being presented in a diagram etc. |
|  | Note that WebAIM says to NEVER specify something as a diagram or an illustration, but other guidelines do not agree with this. We have decided that it is better to not confuse the user than try to follow some standard that is not necessarily accepted by everyone. |
| **What needs to be in the tag** | The tag should give the information that the image is conveying. It should NOT be a visual description of the image. Your audience may have no visual reference points at all. |
|  | Determining what information an image is conveying is VERY HARD to do if you are looking at. You subconsciously get all kinds of information visually without realizing it. To try to determine everything that the image is showing you, listen to the surrounding content without looking at the image. Then analyze the visual parts of the image. Why is something highlighted? Why is there a red arrow pointing to this number? Why is that square smaller than the other square? Why is this image even here? The answers to those questions become the basis for the tag. |
|  | **Ask yourself:**  1. Does the image convey ideas that are not in the same step?  2. What are those ideas? What is the reason for the various visual components of the image?  3. Does the listener need to know that the ideas are being conveyed in a specific format: diagram, chart, illustration, map, timeline to avoid being confused?  4. Is there a context switch that would be confusing if it is not framed by saying what is being described? |
| **Form of the tag** | Tags that are specifying the image as a diagram etc. can start in one of two ways:  (1) They can start with a noun that says what the image is, OR  (2) start with a sentence that says what the image is showing.  This depends on the context surrounding the image and what sounds natural and clear. |
|  | Example of (1): "Table showing the 12 picnic committee volunteers." |
|  | Example of (2): "A diagram shows that one-fifth or 20% of the original $120 cell phone bill is $24. It also shows that your answer of a 16.38% decrease and the $19.68 amount of decrease are both close to 20% of the original cell phone bill." |
|  | The word "show" is fine. In this context it means "demonstrates" or "points out." |
|  | Tags that are giving information should just give the information in a way that flows naturally from the surrounding text. |
|  | Example: "A fraction represents one number divided by another number. The number above the division bar is called the numerator. This is divided by the number below the division bar, which is called the denominator." |
| **Length and style** | The tags are supposed to be succinct. They should not necessarily be "well written"--instead they should sound clear and understandable. Those two things are not always the same! |
|  | They should use the same words and terminology as the text in the steps. |
|  | They are supposed to be less than 150 characters if possible, but practically speaking the screen readers cope with them when they are longer. 450 characters should be the maximum. |
|  | If the tag needs to be longer, then add a link immediately underneath the image that is called "View as text." Upload an html file with the image tag using the ancillary files table, and link to it. The link should use the "Small examples" style, and should be a Shift+Enter underneath the image, not a full Enter. The word "View" is fine and actually recommended for these kinds of links. |
| **Tables** | Any image of a table that has more than 2 columns or 4 rows (more or less) should have a text description if the whole table must be read, so that the user can hear the screen reader read the table the way the user is accustomed to listening to tables. |
| **Tips** | Numbers > 1000 need commas to be read properly with the Chrome screen reader. |

## View as text links for embedded images

### General

If your image requires a very lengthy description, you should create an html document with the descriptive text, and then link to it from a **view as text** link that is placed underneath the image:



### Images of tables

For long tables that have annotations and are presented as images, the html document should include the table, and then a description of the annotations and highlights from the table image. This should use the same language as is used in the Refresher left pane.

1. Make the tables in CKEditor to get the necessary html syntax.

a. Set the Headers drop down to “First Row”

b. Keep all the other table properties set to their defaults. This will generate a nice plain table.

c. Do not add a table caption. The table title will be the title of the pop-up window.

2. Switch CKEditor to “Source” and copy and paste the table into Brackets or some other structured text editor.

3. Add a tag for the title in the first row of Brackets: <title> table title </title> This will be the title of the pop-up window and make the screen reader happy.

4. Add the description of the annotations and highlights underneath the table in a paragraph tag:

<p>Here is the description.</p>

5. Save.

### Uploading html files using CAMPER:

The “view as text” html files are treated as ancillary files. To upload using CAMPLER:

1. Add an entry to the ancillary files table in the form [module id]/[modulette id]/[name].html

* Use underscores instead of spaces in the name.
* Use a name that includes something descriptive so that you know what the file is for.
* It is recommended that you put the file in the same directory as the modulette it accompanies.

2. Exclude the file from Search.

3. Upload the file.

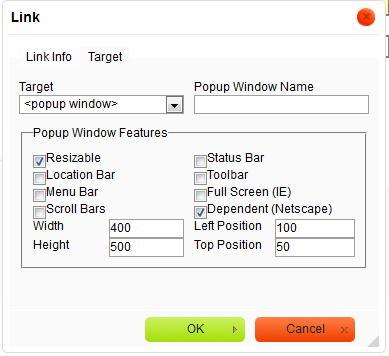
### Adding the view as text link to the mini-lesson:

1. Locate the cursor immediately to the right of the image and use Shift-Enter to add a line break.

2. Select all of the text and use the insert link capability in the authoring tool to add a link to the URL for the html file. Use the S3\_BUCKET\_ convention for the URL:

S3\_BUCKET\_/[file name]

3. For the probability tables, use these settings on the Target tab.:



4. Select the link text, and choose “Small Examples” from the Styles menu. This will make the link nice and small

5. Select the text “ (opens in a new window)” and choose “Screen reader only” from the Styles menu. This will hide this extraneous text from the visual display.

## Accessible versions of Picture its

JUICE presents Picture its in two ways:

1. As pdfs. This format is appropriate for annotated documents and Picture its that are conveying a lot of information or have a lot of text..
2. As images in a single page or multi-page html template. This format is appropriate for Picture its that consist mostly of images.

Picture its that use the html template should use alt text that is added to the template. No additional screen reader support is needed.

While screen readers can read pdfs, most Picture it pdfs will lose some or most of their meaning. In this case, write a text description of the Picture it and save it as an html file. You can use any existing screen reader Picture it file as a template. Upload the file to CAMPER as an ancillary file and add a screen reader only link and accessible icon after the regular Picture it link. It will look like this:



Accessible versions of Picture it linksare expected to open in a new tab. The text associated with the icon reads like this:

Screen reader version of Beginning with a compelling introduction, opens in a new tab

To add an accessible version icon and link after a Picture it, click the Source button in the editor to edit the step Source, and paste this text into it immediately after the </a> tag for the regular picture it:

&nbsp; <a href="S3\_BUCKET\_/CS17/4/Screen\_reader\_picture\_it\_compelling\_introduction" target="\_blank"><img alt="" src="/images/accessible\_icon.png" style="width: 17px; height: 20px;" /><span class="screen-reader-only" style="background-color:#FA839F;">Screen reader version of Beginning with a compelling introduction, opens in a new tab</span></a>

Then close the Source and update the text and the link URL using the editing tools.