

Accessibility for ExploreLearning Gizmos™



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“The power of the Web is in its universality. Access by everyone regardless of disability is an essential aspect.”¹

1. Tim Berners-Lee, W3C Director, physicist, and inventor of the World Wide Web.

For Gizmos on the ExploreLearning site accessibility is a required feature. We strive to achieve accessibility in both our Gizmos and in HTML. This document will present some background information related to accessibility, and focus on the accessibility that is found in the Gizmos.

1.0 Background on Accessibility of Web-based Content

Accessibility is an important issue in society and education. As the web has rapidly expanded in recent years it becomes more and more integrated with classroom education, so having content accessible to all students and teachers is a high priority.

There are several different organizations that have published guidelines for accessible content. In America, Section 508 requires that Federal agencies' electronic and information technology is accessible to people with disabilities. The World Wide Web Consortium aims for full accessibility among all users, and the National Center for Accessible Media has done a significant amount of research focused on accessibility in math and science education.

1.1 Section 508

In 1998, Congress amended the Rehabilitation Act to require Federal agencies to make their electronic and information technology accessible to people with disabilities. Inaccessible technology interferes with an individual's ability to obtain and use information quickly and easily. Section 508 was enacted to eliminate barriers in information technology, to make available new opportunities for people with disabilities, and to encourage development of technologies that will help achieve these goals. The law applies to all Federal agencies when they

develop, procure, maintain, or use electronic and information technology. Under Section 508 (29 U.S.C. 794d), agencies must give disabled employees and members of the public access to information that is comparable to the access available to others. Schools that obtain Federal funding are required to follow these guidelines.

Additional information related to Section 508 can be found at <http://www.section508.gov>

1.2 World Wide Web Consortium

The World Wide Web Consortium (W3C) develops interoperable technologies (specifications, guidelines, software, and tools) to lead the Web to its full potential. W3C is a forum for information, commerce, communication, and collective understanding.

The W3C has developed the Web Accessibility Initiative (WAI). The WAI, in coordination with organizations around the world, pursues accessibility of the Web through five primary areas of work: technology, guidelines, tools, education and outreach, and research and development.

The WAI has recently published the User Agent Accessibility Guidelines. The document provides guidelines for designing user agents that lower barriers to Web accessibility for people with disabilities (visual, hearing, physical, cognitive, and neurological). User agents include HTML browsers and other types of software that retrieve and render Web content. A user agent that conforms to these guidelines will promote accessibility through its own user interface and through other internal facilities, including its ability to communicate with other technologies (especially assistive technologies).

Additional information related to this can be found at <http://www.w3.org/WAI/>

1.3 National Center for Accessible Media

The CPB/WGBH National Center for Accessible Media (NCAM) is a research and development facility dedicated to the issues of media and information technology for people with disabilities in their homes, schools, workplaces, and communities.

NCAM's mission is: to expand access to present and future media for people with disabilities; to explore how existing access technologies may benefit other populations; to represent its constituents in industry, policy and legislative circles; and to provide access to educational and media technologies for special needs students.

NCAM has been working for several years on NSF projects to capture access challenges and solutions and present them in a format specifically designed to educate and assist educational software developers. This has now been

extended to web-based content. They have published extensive guidelines particularly focused on content for math and science education.

Additional information related to this can be found at <http://www.ncam.wgbh.org/cdrom/guideline/>

2.0 ExploreLearning Gizmos™

Using the guidelines published by the groups in Section 1.0, “Background on Accessibility of Web-based Content,” on page 1, we continue to improve the ExploreLearning Gizmos in terms of accessibility. Our site contains Gizmos that have been created over the past decade, but all the Gizmos that have been added in the past year are accessible in several ways (about 70% of our entire Gizmo collection is accessible at this time): full keyboard accessibility, high contrast graphs, and a good choice of colors to insure visual clarity. These options are included when the image shown in Figure 1, “Graphical Logo Associated with Accessible Gizmos,” on page 3, is visible on the Gizmo Details page.

FIGURE 1.

Graphical Logo Associated with Accessible Gizmos



2.1 Keyboard Accessibility

In the accessible Gizmos there are several keys that allow users to have full control of the Gizmo via the keyboard. With the Shockwave Plug-in one must first click the mouse on the Gizmo (to make it the active element of the page). After making the Gizmo active the primary keys are shown in Table 1, “Proper Keys for Accessibility in EL Gizmos,” on page 3. These keys can be used to control all features of the Gizmo.

TABLE 1.

Proper Keys for Accessibility in EL Gizmos

Main Key	Alternate Key	Function
n	TAB	move to next accessible element
RETURN	ENTER	activate accessible element
j (or J)	left arrow	send left event to accessible element
l (or L)	right arrow	send right event to accessible element
i (or I)	up arrow	send up event to accessible element
k (or K)	down arrow	send down event to accessible element
SHIFT	SHIFT	used for additional functionality with keys above
? or /	? or /	shows tool tip associated with active element

When making use of keyboard shortcuts, many of us at ExploreLearning have gotten used to using the Alternate Key set. This set works in most situations, but with certain screen readers the Main Key set should be used. Both sets are fully supported in the accessible Gizmos.

The easiest way to get familiar the keys is to go ahead and start using them in a Gizmo. In an accessible Gizmo (that has been clicked on to make it active) you can start pressing the TAB key (or the n key). The active element will be highlighted with the accessibility region indicator as shown in Figure 2, “Common Gizmo Elements Highlighted During Keyboard Access,” on page 4.

FIGURE 2.

Common Gizmo Elements Highlighted During Keyboard Access



After making a checkbox the active accessible region you can press RETURN or ENTER to flip the checkbox from off to on (or on to off). Whenever you have made a button active with the accessible region you can press RETURN to press the button. If you TAB to a slider knob and it become highlighted, the left arrow (or J key) can be used to move the knob to the left (which will often decrease the value of the slider). To move the slider knob to the right, the right arrow key (or the L key) can be pressed.

To manually enter a value in the slider field the numerical value should be highlighted. Then press RETURN. This activates the text so you can directly type in a value (such as 3.5). To indicate that you are done press the RETURN key after the selected number has been typed.

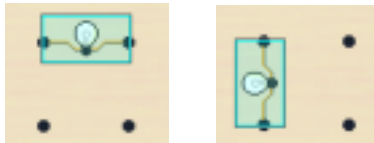
As was stated in Table 1, “Proper Keys for Accessibility in EL Gizmos,” on page 3, the SHIFT key often adds functionality to another key. In terms of moving from one element to another by pressing the TAB key, you can also hold down the SHIFT key when pressing TAB, and the active element will move backwards. When moving a slider knob with the left or right arrows, holding down the SHIFT key will cause the slider knob to move ten times further than it would when not holding the SHIFT key.

In many Gizmos objects need to be moved around on the screen. Once an object is active, the left, right, up, and down arrows will generally move the object around on the screen. In some cases holding the SHIFT key down (in combination with the arrow keys) will rotate the object. In the Circuits Gizmo that

is exactly how the various circuit elements can be moved around on the circuit board (shown in Figure 3, “Objects in Circuit Gizmo Before and After Rotation,” on page 5).

FIGURE 3.

Objects in Circuit Gizmo Before and After Rotation



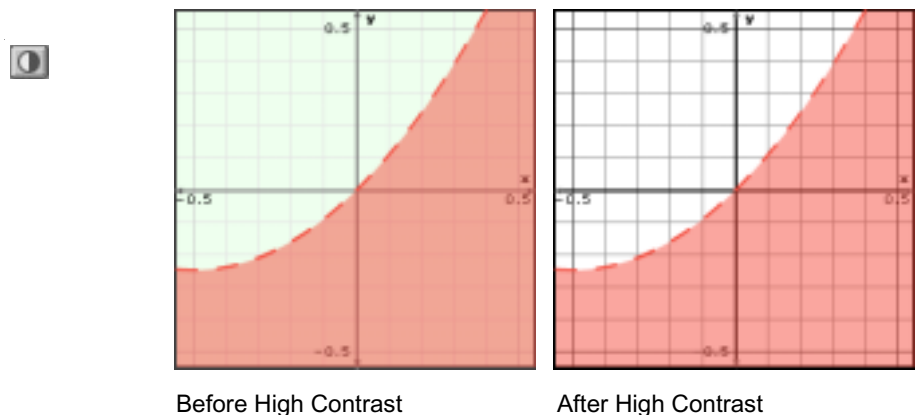
For certain Gizmos custom key combinations may be required for full keyboard accessibility due to the complexity of the Gizmo functionality. In those cases more information will be available in the Exploration Guide associated with the Gizmo.

2.2 High Contrast Button

At the bottom right corner of most Gizmos is the high contrast button. For many graphing Gizmos this button will enable the high contrast mode of the buttons. An example of this is shown in Figure 4, “The High Contrast Button and Effect on a Graph,” on page 5. This helps with visual clarity, and is often useful when using a projector in the classroom environment.

FIGURE 4.

The High Contrast Button and Effect on a Graph



2.3 Additional Considerations

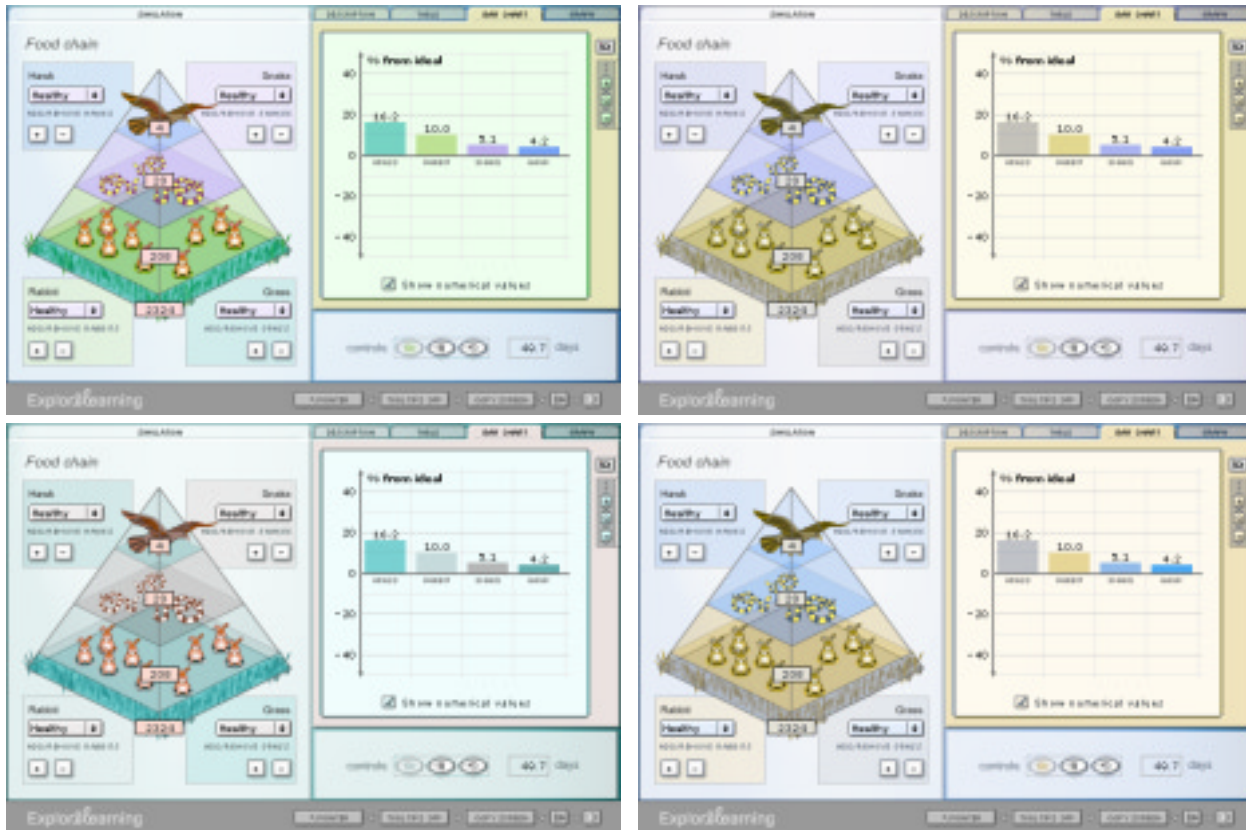
For each Gizmo color options are always considered when selecting the hues and colors. A Photoshop plug-in is used that allows our designers to observe image clarity for color deficient viewers by accurately simulating color blindness.

A sample showing the three main types of color deficiency is shown in Figure 5, “The Three Primary Types of Color Deficiency,” on page 6.

FIGURE 5. The Three Primary Types of Color Deficiency

Standard

Protan



Tritan

Duetan

Presenting information in multiple formats is also a key consideration. In almost all Gizmos there are multiple representations of the same data: a visual representation of data, a data table, a bar chart, and a graphical representation. In most situations the data in the table can be copied from the Gizmo and used in Excel (or a similar product) for later investigations. The graphs, charts, and visual representation can also be copied to the clip board for later use in reports, discussions, assessment content, or presentations.

In the vast majority of our Gizmos there are no time-based issues, such as having to answer a question within a certain time frame. Users can spend as much time as they need to learn a particular topic that is not immediately clear, or answer questions that are presented in certain Gizmos. A significant amount

Summary

of consideration also goes in to the graphical layout of the Gizmos, in an effort to keep items grouped for clear understanding. Graphical elements are both labeled, and indicated by color for visual clarity. In cases where a sound is produced in the Gizmo, it is generally accompanied by a visual indicator (such as a change in a button image).

3.0 Summary

It would be great if our Gizmos had 100% accessibility for people with visual, hearing, physical, cognitive, and neurological disabilities, but a perfect score is rarely achieved in the real world. As software improves from a technological standpoint we continue to conduct research in to ways to improve the accessibility of the Gizmos (such as text-to-speech options, and auditory graphing representations).

As was stated, more than 70% of our current Gizmos have keyboard accessibility, have been checked for color deficiency, and have multiple forms of presentation for the data. At the present time no Gizmos are released without these minimum requirements, so the percentage of the accessible Gizmos continues to increase over time. By the end of 2004 we expect that more than 90% of our Gizmos will be accessible.

If you would like more information please send an email message to:

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