Accessibility Issues for Preparing Pedagogical Content in Edukalibre.

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Accessibility is a crucial issue when designing web materials – everyone should be able to access the information contained in a web site regardless of physical, economical, or technological circumstances. With a project such as Edukalibre, accessibility is bound to be a factor in the dissemination of the finished product. It should therefore be a factor when the pedagogical content is designed and on-line educational materials are developed. Consequently, accessibility should be considered in the choice of the virtual learning environment for Edukalibre and in any extensions to this environment the project delivers.

This document will introduce the concept of accessibility and will justify why it has to be consider in Edukalibre. An outline of how accessibility can be taken into account in on-line learning and in Virtual Learning Environments will be used to draw requirements for the design of the pedagogical content and the software produced in this project.

WHAT IS ACCESSIBILITY

Accessibility means that everybody should be given access to information on the web [1]. This could refer to:

- **Platform and browser compatibility** - people should be able to access a web site despite the type of hardware, platform, and browser they use;
- **Access for users with disabilities** - visual disabilities (low vision, colour blindness, complete blindness), hearing disabilities (hard of hearing, deafness), motor disabilities (e.g. repetitive stress injury), cognitive disabilities (e.g. dyslexia, dyscalculia, attention deficit disorder, memory impairments);
- **Access for users with different types of user agents** – e.g. screen readers, PDA's, mobile phones.

To address accessibility one needs to consider the variety of uses of web content [1]. For instance, some people may not use a mouse and navigate through keyboard; users with low vision often use large font sizes and may not be able to distinguish fine details, many connections are still slow and the speed of downloading large graphics and multimedia resources can be frustrating, generally the average user is not prepared to invest time and resources to upgrade to the latest browser version.

The World Wide Web Consortium (W3C) through its Web Accessibility Initiative (WAI) has outlined basic principles for the design of accessible web materials [2]. Web content should be **perceivable** (all content should be presented in forms that can be perceived by any user), **operable** (the user should be able to operate with the interface elements in the content), **understandable** (users should easily understand the content and controls), **robust** (the web content should work with current and future assistive technologies and user agents).

When accessibility is addressed, everybody benefits because the web content is better structured, more flexible, and easily absorbed. Accessibility improves web usability.

WHY CONSIDER ACCESSIBILITY IN EDUKALIBRE

The EU educational programmes, and Socrates in particular, stress the need for offering education to all citizens, widening participation in education, and fighting against any forms of exclusion. The European Commission mandate 273 states that all products should be accessible to 100% of the population, European standards to make the Information Society accessible to everyone have been imposed [3]. The global vision is of eEurope accessible for all and this relates to all electronic services, including web-based education. Any innovative technologies for effective on-line learning should therefore address accessibility as a key factor.

The EU is pushing towards standardisation with regard to accessibility, and member states should have their legislation in order. This has already been considered in countries partners in this project, e.g. Germany [4], Portugal [5], Spain [6], UK [7]. For example, a Special Education Needs and Disability Act [7] in the UK requires that by law any further and higher education institution should ensure that all teaching and learning resources comply with accessibility standards. Edukalibre partners should comply with the legislation of their own countries (which all impose some degree of web accessibility).

However, the strongest argument for considering accessibility as an important factor in Edukalibre comes from its main objective. The overall intention is that this project will provide "open" learning materials that can be used and modified by a wide international community of university teachers and students. Edukalibre is expected to show best practice in applying the principles of developing libre software to the development of learning materials. Hence, it is required that accessibility standards are imposed both on the tools developed and the content produced, so they can be deployed in any country, do not exclude any user categories, and are available to the widest possible audience.

ACCESSIBILITY AND VIRTUAL LEARNING ENVIRONMENTS

Accessibility should be introduced at all stages of the design, development, and deployment of Virtual Learning Environments:

- All learning materials, as well as their web site material, should be accessible to every learner.
- Users should be given advise how to create accessible learning materials.
- Accessibility should be introduced into the decision making and implementation stages of VLE.

When a teaching institution has to take a decision about using a particular VLE, one of the requirements is that this VLE addresses accessibility at a sufficient level [8]. Commercial VLEs have clearly declared their accessibility policy and adherence to the W3C WAI standards, see for example Blackboard [9] or WebCT [10].

HOW TO PREPARE ACCESSIBLE ON-LINE LEARNING MATERIALS

This section follows [11] to outline main accessibility issues that have to be taken into account when preparing e-learning content. These issues can be considered as accessibility guidelines for preparing the pedagogical content in Edukalibre.

Page and site mark up

- *Valid HTML*

Many web resources are written in non-valid HTML (particularly those which use authoring or converting tools). This may result in assistive technology for some users presenting and interpreting information inaccurately. Valid HTML should be used that complies with the W3C standards. Each page should include a declaration of the version of HTML being used and the natural language of the document. Page structure should be presented with the appropriate use of HTML elements, such as headings and lists.

- *Detailed structural mark-up for tables and forms*

Tables and forms should be created using detailed structural mark-up, including row and column headers, and groups of columns and rows. A separate description of the contained data should be provided for complex tables. Similarly, detailed information about form structure should be provided. All components of a form should appear in a logical order, so that people can follow the progression. The instructions should always appear first, then the fields, and the 'submit' button should be the last feature.

- *Using CSS to specify page layout*

Page layout and appearance should be specified using CSS. There are still some browser limitations and CSS may not always provide a specific layout. In all cases, the web page should be checked in a linear browser (e.g. Lynx) to ensure the information will make sense when read with a screen reader.

- *PDF documents should be used with caution*

While PDF preserves appearance and is platform independent, many screen readers cannot read correctly pdf files. With pdf files, accessibility for visually impaired users cannot be guaranteed. When information is presented in a pdf format, there should be an alternative way to see this information in a browser, e.g. in HTML. The most appropriate use of pdf is for downloading documents intended for printing [11].

Navigation

Visually impaired people browse through a web page in a linear way, line by line. To reduce browsing time they often tab through the content. Many physically disabled people may not use the mouse and can rely only on the keyboard. The navigational features are vital for such people to be able to use the web page effectively. These features include:

- *Indicate destination place in hyperlinks*

The text on hyperlinks should clearly indicate destination page, click here and any confusing text for the links should be avoided. Clear indication should be provided for the user when the links refer to non-HTML documents or open destination pages in a separate browser.

- *Do not rely on client site JavaScript for navigation*

If navigation relies upon JavaScript in the client site, the web site may become inaccessible when JavaScript is turned off or not supported.

- *Provide appropriate navigation information*

All pages in a web site should have appropriate titles, hyperlinks should be consistent with titles and headings of the documents they refer to. Search facility and site maps should be provided when possible.

- *Check that the page is accessible via keyboard*

Keyboard navigation has to be enhanced by ensuring the forms can be followed logically. Shortcuts should be provided to access important content.

Page appearance

- *Clear language and easy to understand text*

Any educational materials should be written in a clear language with correct spelling and grammar. Text should be broken into short paragraphs or lists. Default text has to be sensibly chosen, there should not be many text appearances. Font size should be specified in relative terms allowing users to increase size as they wish. Colour should not be relied on solely to distinguish important parts, luminance should be used to create contrast.

- *Use CSS and test in a variety of browsers*

CSS is the recommended style for controlling page appearance. This enables characteristics that control the page appearance to be stored separately to the web content and can be changed by the users, if necessary. Page appearance should be tested using CSS in a variety of browsers.

- *Ensure access in browsers that do not support frames*

Frames are usually avoided, but when these are used, ensure that the users can access the content with browsers that do not support frames.

Graphics and multimedia content

As shown in the user needs study (see document from Bridget Cooper), all partners envisage the use of some graphics and multimedia resources. These can play a significant role in complex abstract domains, such as Mathematics and Physics which will be considered in Edukalibre by some partners. Multimedia resources enhance learning and their use is highly encouraged. However, there are many potential accessibility problems associated with multimedia web content that have to be considered carefully. The guiding principle is: *ensure that all graphical and multimedia content is provided in an accessible format*.

- *Use sensible names for image files*

All images and buttons should be sensibly named so that a user can get a basic understanding of what the picture/button is about (e.g. avoid names like image1.jpg, put a meaningful name instead).

- *Provide ALT descriptions for graphics and image buttons*

The ALT Text tag should be used to provide a text description of an image for individuals using non-graphic browsers. For complex figures long descriptions should be provided, these are better placed as a noticeable link near the image. Image buttons should include alternative text with the destination of the link. Textual hyperlinks access should be provided for image maps.

- *Use well-designed meaningful graphics*

Designing good graphics is an art. Good graphics (a) consists of complex ideas communicated with clarity, precision and efficiency; (b) gives to the viewer the greatest number of ideas in the shortest time with the least ink in the smallest space; and (c) always tells the truth about the data [12].

- *Provide textual descriptions for animations and videos*

Providing accessible animations and videos is a challenging task. Multimedia objects should have sensible captions and appropriate textual descriptions to clarify what is shown in a video or in animation.

WAI Quick tips to make accessible web sites

The list below has been taken from [13].

- **Images & animations:** Use the **alt** attribute to describe the function of each visual.
- **Image maps.** Use the client-side **map** and text for hotspots.
- **Multimedia.** Provide captioning and transcripts of audio, and descriptions of video.
- **Hypertext links.** Use text that makes sense when read out of context. For example, avoid "click here."
- **Page organization.** Use headings, lists, and consistent structure. Use **CSS** for layout and style where possible.
- **Graphs & charts.** Summarize or use the **longdesc** attribute.
- **Scripts, applets, & plug-ins.** Provide alternative content in case active features are inaccessible or unsupported.
- **Frames.** Use the **noframes** element and meaningful titles.
- **Tables.** Make line-by-line reading sensible. Summarize.
- **Check your work.** Validate. Use tools, checklist, and guidelines at http://www.w3.org/TR/WCAG

Accessibility checking techniques

There are a number of techniques that enable developers to quickly check the accessibility of their web sites.

- *Manual check*

Change the size, is the site readable. Turn off the images, can you still understand the content. Remove style information, is the content still readable. Use tab to go through the links, can you navigate properly.

- *Test in different browsers*

Use alternative browsers, see for example [14]

- *Use free check list tools*

See techniques for accessibility evaluation and repair tools [15]. The most commonly used checking tool is Bobby [16].

IMPLICATIONS FOR THE VIRTUAL LEARNING ENVIRONMENT USED IN EDUKALIBRE

Moodle, Claroline and ATutor are now installed at the locations below[1], with one course running on each (but no real content). These three systems were tested using the Bobby online validator.
The BOBBY reports suggest that none of these systems meet even the most relaxed of guidelines (W3C WAI A guidelines [17]).

The main issue

A quick look at the source HTML produced by these three systems reveals that they all make heavy use of HTML tables for laying out their pages. Using tables for layout can make it very difficult for screen readers to decipher the page in a way that a visually impaired user can understand. This is due to the nature of an HTML table. HTML tables were designed to be used to display tabular data, not to control the layout of a page, so most screen readers presume they have a table full of figures when they encounter one in the HTML.

Though many people still use tables to control page layout, the accessible alternative (Cascading Style Sheets) have now been around long enough for people to be using them for controlling the appearance of production systems. Style sheets also have huge advantages when altering the appearance of a site, or rendering the site for different platforms.

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[1] Moodle installation (http://test.chrispyfur.net/moodle/moodle/), Claroline installation (http://test.chrispyfur.net/claroline/), ATutor installation (http://test.chrispyfur.net/atutor/). The administrator username and password for all three installation is *admin* and *seapope*.

Whilst it is possible to make a site that uses a table based layout scheme meet the accessibility guidelines, it is improbable that the resulting system will be easy to navigate for a visually impaired user, and the resulting system is likely to be less scalable and much more difficult to port to a different platform.

The links, images and table headers in all systems are inconsistently labelled (if at all) which also leads to confusion for alternative browsers, and means the systems do not conform to the WAI guidelines.

References

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