# WikiVIKO : Information Literacy on a Wiki Platform - or how to secure equal Access for Students with Disabilities

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## Introduction

The <u>NTNU Library</u><sup>1</sup> (Norwegian University of Science and Technology<sup>\*</sup> Library) is in the process of implementing the principles of universal design in <u>VIKO</u><sup>2</sup>, NTNU's web based course in information literacy, and this paper describes how the use of universal design and web accessibility secures equal access to information resources on the web for students with disabilities.

The paper is organized as follows: First a brief overview of universal design and web accessibility and why it is important, secondly the laws and regulations in Norway concerning universal access. Then follows a description of DokuWiki, and lastly we discuss the process and methods of migrating VIKO to a wiki platform.

# About universal design

Ron Mace, creator of the term "universal design", describes universal design as "...the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design."

"The intent of universal design is to simplify life for everyone by making products, communications, and the built environment more usable by as many people as possible at little or no extra cost. Universal design benefits people of all ages and abilities". (Center for Universal Design<sup>3</sup>)

#### Basic principles for universal design

- Equitable use The design is useful and marketable to people with diverse abilities.
- **Flexibility in use** The design accommodates a wide range of individual preferences and abilities.
- **Simple and intuitive** Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.
- **Perceptible information** The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.

<sup>\*</sup> Norwegian university of science and technology is situated in Trondheim. It is the second largest university in Norway, with 20,000 students and 3000 degrees awarded each year. NTNU Library has 10 branch libraries. The library has a strong focus on user education and information literacy. More information about NTNU at http://www.ntnu.no

- **Tolerance for error** The design minimizes hazards and the adverse consequences of accidental or unintended actions.
- **Low physical effort** The design can be used efficiently and comfortably and with a minimum of fatigue.
- Size and space for approach and use Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user's body size, posture, or mobility.

## Universal instructional design

Universal instructional design (UID) applies the principles of universal design to teaching and instruction. UID is a process that involves considering the potential needs of all learners when designing and delivering instruction.

- UID means identifying and eliminating unnecessary barriers to teaching and learning while maintaining academic rigour.
- UID evolved from the concept of universal design in the physical world, where domains such as architecture and industrial design have identified key goals for their products, including flexibility, consistency, accessibility, explicitness, and supportiveness. UID applies these very same principles to teaching and learning.
- The application of UID principles enables all students to have access to a greater range of teaching materials
- UID is about truly universal thinking it goes beyond just accessibility to reflecting on how to maximize learning for students of all backgrounds and learner preferences while minimizing the need for special accommodations.

# Web accessibility

"The power of the Web is in its universality. Access by everyone regardless of disability is an essential aspect." This well known quotation from Tim Berners-Lee, the Director of the <u>World Wide Web Consortium</u><sup>4</sup> (W3C), is cited on the <u>Web Accessibility Initiative</u><sup>5</sup> (WAI) web page. In reality millions of people have disabilities that affect their use of the Web. Currently most web sites have accessibility barriers that make it difficult or impossible for many people to use the Web.

Web accessibility is based on principles for universal design, which means that products, services and environments are designed to be usable (without modification) for as many people as possible, regardless of age, ability or other factors. Web accessibility means that people with disabilities can use the Web, more specifically that they can perceive, understand, navigate, and interact with the Web. They can also contribute to the Web, and in that way participate more actively in society.

Designing web sites with accessibility in mind can enhance usability for all users, including those with visual, auditory, physical, speech, and neurological disabilities, and also benefit people without disabilities.

It is important to distinguish accessibility from usability. Accessibility secures access to information at a web site while usability means "ease of use" in navigating an interface.

Jacob Nielsen defines usability<sup>6</sup> as: "Usability is a quality attribute that assesses how easy user interfaces are to use. The word "usability" also refers to methods for improving ease-of-use during the design process."

This implies that a web site can be accessible but not usable, or usable but not accessible.

# WCAG and WAI

W3C Web Accessibility Initiative develops the <u>Web Content Accessibility Guidelines</u><sup>7</sup> (WCAG). The guidelines are based on the fundamental technical specifications of the Web, such as HTML, XML, CSS, etc.

The WCAG documents explain how to make web content accessible to people with disabilities. Web "content" generally refers to the information in a web page or web application, including text, images, forms, sounds etc.

The guidelines for content, WCAG 1.0, date back to 1999. The weak points of the guidelines are a strong HTML- and CSS-angle, and that they don't take in new technologies (related to Web 2.0 etc). WCAG 2.0 was published December 2008. They build upon the work of WCAG 1.0, but WCAG 2.0 applies broadly to more advanced technologies; is easier to use and understand; and is more precisely testable with automated testing and human evaluation.

## Background

Universal access is an important measure to ensure that students with disabilities have the same rights and opportunities as other students in higher education. Several groups will benefit from accessible design, including:

- People who are blind (either totally blind or with no useful sight) who need to use screen reading technology or refreshable Braille to access the Web.
- People with a visual impairment who need to use screen magnification or screen enlargements/adjustments.
- People with a learning difficulty such as dyslexia who need to adjust the screen or text or who use screen reading aids.
- People who have a hearing impairment and need to have any audio or sound captioned or described in text.
- People who have a physical impairment that does not allow them to use a mouse, or who need to use assistive technologies such as joysticks, switches, or speech input to access the Web.

Of the above groups, the people who would most benefit from good web design are generally people who are blind, partially sighted, or dyslexic, and in particular those who use screen reading technology (Brophy and Craven, 2007).

Blind and visually impaired users have problems with overview and with graphical interface when using PC. The most common problems are related to text that cannot be scaled, poor contrast between the text and the background, lack of alternative text when using graphics and pictures, and deviations from the standard HTML format. A blind person reads the screen line

by line and navigates from top to bottom. Screen reading programs reads text only, which means that all graphics, buttons, hypertext links etc. must have alternative text to be usable. They often have to use other software, called assistive technologies, to interact with the Web.

Examples are:

- Screen magnifiers to change text font, size, spacing, colour, synchronization with speech, etc in order improve the visual readability.
- Screen readers, which are used by people who are blind to read textual information through synthesized speech or Braille.
- Text-to-speech software, to convert text into synthetic speech.

From a technical point of view, web accessibility is important to ensure interoperability between different applications and to enable users to access the Web using their preferred format. This could be via assistive technology to interact directly with the site or to download information into an alternative format (Brophy and Craven, 2007). The success of these technologies lies also in the design of web sites. Unless accessibility is built into the design of a site, even the most up-to-date assistive technologies will still be unable to access it.

# Norwegian laws and regulations

Norwegian authorities stress the importance of enabling everyone to become digital citizens in our new "E-society". In June 2005 The Norwegian Ministry of Government Administration and Reform launched the <u>eNorway 2009 action plan for a digital society</u><sup>8</sup>. According to this plan, 80 % of Norwegian public websites should follow quality specifications from <u>Norway.no</u><sup>9</sup> by the end of 2007. Norway.no acts as a gateway to the public sector in Norway, and is also responsible for developing criteria for the evaluation of public web sites.

<u>The Anti-Discrimination and Accessibility Act</u><sup>10</sup> came into force 1. January 2009. The Act's purpose is to strengthen the legal protection against discrimination on the basis of disability and contains rules concerning universal design, accessibility and user friendliness and it also applies to ICT.

Schools and other educational institutions are obliged within reason to individually accommodate the educational institution and the teaching in order to ensure that pupils or students with disabilities are given equal opportunities for education and training.

The government wants the entire public administration to follow the WAI criteria when developing and maintaining public websites. This is apparent from the report to the Storting "An information society for all"<sup>11</sup> which was published in December 2006. The Government also encourages other websites to follow these criteria.

Every year, Norge.no ranks all public websites in Norway based on user friendliness. Among other things, the WAI criteria are emphasized when the websites are being evaluated.

# National facilitator for accessibility

NTNU has been given the role as a "National facilitator" for accessibility to higher education in Norway for students with disabilities. They operate <u>universell.no<sup>12</sup></u> a website for universal design and accessibility, and for individual adjustments in higher education. NTNU endeavours to ensure that students with disabilities have the same rights and opportunities as other student in higher education. NTNU will emphasize physical, pedagogical and social accessibility, and has established "Office for students with disabilities" to ensure accessibility to buildings and studies for these students, this also includes curriculum and all electronic and printed information.

# From VIKO to WikiVIKO

VIKO is an acronym for "Veien til Informasjonskompetanse" in English: "Your Guide to Information Literacy". VIKO is a web based interactive course, consisting of seven modules. VIKO can be used as part of other library and university courses and is implemented in NTNU's eLearning platform. The modules and their component parts present ways to navigate through the information flow, and provide practical tools for finding literature, evaluating the quality of the information and writing papers and references.

VIKO aims to:

- Enhance information literacy at NTNU.
- Increase quality of students' performance.
- Replace basic-level user education.
- Teach students essay writing and source evaluation techniques.
- Support teachers in student tutoring.
- Prevent plagiarism.

VIKO is an in-house project designed and developed at the NTNU Library. The project was financed by the <u>Norwegian Archive, Library and Museum Authority</u><sup>13</sup> and NTNU. VIKO version 1 was released July 1st 2004. VIKO version 2, including 35 subject guides was completed 2008. VIKO is also available in English.

The NTNU Library offers library classes to students with disabilities. To meet the needs of these students the library must provide special equipment and adjust the library resources, and the library instructors need adequate qualifications. If VIKO is made accessible for all, these students will have a tool for self-tuition, and the library will have a tool to use in classes and courses.

# Testing VIKO

Our aim for VIKO is to make it accessible for all, implementing the principles of universal design. We had VIKO tested by The Norwegian ICT-centre for the Visually Impaired (SIKT). VIKO was tested by two test persons, one blind test person using screen reader (Jaws 5.10), the other test person had low vision, and used a screen magnifier (ZoomText v 8.1). Both test persons used synthesized speech as a supplement.

The results of the test showed that most of VIKO was accessible and useful to the visually impaired, but still there were parts of VIKO they could not "see".

Main problems were:

- VIKO Start page: The whole page is an image map, with a mouse over function to show hypertext links. Alternative text (alt attribute) for hypertext links are missing. The page is not accessible using screen reader; it is not possible to identify hypertext links to the program modules.
- Top menu: Drop down menu with graphics instead of text, alt attributes to describe functions are missing. Menus are not accessible using screen reader. There is also a problem to keep focus when using a screen magnifier.
- Main content: Header tags (h1, h2, etc) are not used for headings, which mean that it is difficult to find important content.

VIKO is maintained as a set of loosely connected HTML, CSS and JavaScript files, with manual linking of web-pages, extensive use of tables and frames. The increasing number of course specific sub pages and the need to quickly reorganize and translate made this approach increasingly difficult. Maintenance grew, and the heavily JavaScript driven navigation menus were an obstacle to the overall accessibility.

Our solution to make VIKO accessible is simple: Follow guidelines and standards so that the assistive technologies can interact with VIKO. The most important standards are:

- WAI recommendation
- XHTML 1.0
- CSS (Cascading Style Sheets)

Our first plan was to review all VIKO web pages (coding, scripts, menus, functions) both manually and using automatic code-testing program, and improve the code using standards and recommendations.

It turned out to be difficult to implement WCAG with the existing VIKO software and we therefore had to find a new publishing platform for VIKO, which should:

- Follow guidelines and standards so that the assistive technologies can interact with VIKO
- Support an easy system for navigation and menus.
- Be dynamic and make it easy to add new pages and modules.
- Provide equal access for students with disabilities.
- Make it possible to publish VIKO on mobile units (iPhone, smart phones, PDAs, etc).
- Be free or low cost and easy to maintain.

Kjetil Knarlag, the collaborator at "Office for students with disabilities" suggested we let an expert on universal design for web evaluate VIKO and help us find software that meets the above requirements. On his advice we contacted Rune M. Andersen, chief engineer at Faculty of Information Technology, Mathematics and Electrical Engineering, NTNU. He recommended transferring VIKO to DokuWiki.

# DokuWiki

A wiki is a web page designed to be easily edited "in context", meaning the editing is done while remaining at the page that is to be edited, without the need to access a separate backend system. Wikis are in general open systems, allowing users to extend and improve each others work gradually.

The free encyclopaedia Wikipedia.org<sup>14</sup> is probably the most known and referred to wiki on the web. From its creation in 2001, the English branch alone now <u>exceeds 2.8 million</u> <u>articles</u><sup>15</sup>. Wikipedia demonstrates the quality of the wiki tool MediaWiki, the power of a large community and the effectiveness of a wiki based website.

<u>DokuWiki</u><sup>16</sup> was created in June 2004 by the German computer programmer Andreas Gohr as a "standards compliant documentation wiki for personal and small business use". Currently it is, together with MediaWiki, one of the two most popular wiki engines according to www.WikiMatrix.org<sup>17</sup>.

DokuWiki fulfilled the requirements of an easy-to-install, easy-to-use, free and open source wiki. It was already in use at the university as an unofficial and less cumbersome alternative to NTNU's chosen content management system (CMS) Escenic. It had proven to be reliable, and was from the ground up built to support web standards.

Adhering to current standards is important, as semantically correct code is needed to assure equal access to all user groups, with or without the use of assistive technologies. Guaranteeing same behaviour across different browsers is difficult enough, making a page render correctly for tools like screen readers is even more important, as blind users will be thrown off track if the content is out of order.

A few of the VIKO features did not exist as part of the core wiki at the time it was installed, but the plug-in API made it possible to programme the extensions ourselves. A template would also have to be designed to create the VIKO look-and-feel we wish to present. We based the design on the default layout of DokuWiki, as it had a clean and properly structured code base. Currently the web design is starting to resemble the sketches we have drawn, but there's still work to be done.

# Migrating to DokuWiki

The NTNU Library started the in-house project WikiVIKO to transfer VIKO to DokuWiki in October 2008. In addition to the VIKO-team consisting of 3-4 library employees, Rune M. Andersen was engaged as the projects technical consultant.

Principles for WikiVIKO:

- Keep VIKO's existing content and structure. WikiVIKO is a course with seven modules and 35 subject guides. WikiVIKO can also be used as a reference tool. The students can use WikiVIKO as a course or navigate to relevant pages.
- Use links to Wikipedia for definitions and "further reading" concerning new technology in order to simplify maintenance and updating. Existing DokuWiki features automated this process.
- Continue to publish under Creating Commons licenses and use Creative Commons licensed illustrations.

The technical work started by downloading and installing the latest version of the DokuWiki software on the VIKO servers. DokuWiki runs on PHP<sup>18</sup> and requires no database as it stores data in text files. Not needing a database makes installation, and later moving, of the system swift and easy. We applied the <u>NTNU template</u><sup>19</sup> to get a sidebar and a navigation structure. Wikis often lack the hierarchical menus we find on large websites and rely more on inter page linking, tagging and searching. However, since VIKO is meant to be a hierarchical built tutorial (with the option of linear reading), we needed to bring back the navigation.

The project group had a short session together with Andersen to learn how to use the system, and was shortly after able to begin the migration of pages. As the original data mostly consisted of slightly differently structured HTML pages, no attempt was made to automate the process. This meant a tedious copy/paste work had to be done, and the new content would need to be reformatted into DokuWiki syntax. Luckily, migrating pages could be done in parallel and was unobstructed by template and plug-in development, since that was done at another server.

## Plug-ins

Extending features in DokuWiki is done by developing plug-ins. First we saw the need for a definition list. This is not part of the core DokuWiki syntax features, but our problem was already solved by the community, all we had to do was download, install and adjust the plug-in.

The original VIKO had a "next-in-order" button feature, allowing the user to read the tutorial in sequence, without the need to use the navigation menus. No such feature existed in core DokuWiki or the community plug-in pool. We defined a syntax, and a plug-in recognizing this syntax in pages. As a result it adds both a non-visible rel-link in the header and a visible button on the page. This semantically links pages together in a given sequence, as well as give the user visible navigation help.

Two more features will be needed: a quiz plug-in with social media integration (Facebook, Twitter, etc) and a "folded content" plug-in. Folded content will be used to collapse sections on a page into an accordion-like reading sequence. Clicking a section header expands the content while hiding other sections. To maintain accessibility the functionality will be added on top of a standard page, thus degrading gracefully if JavaScript is disabled in the browser.

#### Navigation

A sidebar on the left hand side of the screen will contain the navigation menu. The menu is built as nested unordered lists of links. All items will be visible at all times in the code, but JavaScript will collapse inactive menus in the visual display of the browser. This approach eliminates one extra page load, while still being accessible to non-visual browsers.

#### Design

Graphic designer Rurik Greenall was hired to create a design template for DokuWiki that would fit VIKO. The previous designs were outdated and did not have room for the

navigation scheme we wanted. The design would be <u>grid based</u><sup>20</sup>, meaning that text and graphics are arranged according to a system of structural rows and columns. Grid layouts are well known from print media and are growing popular on the web, in particular on design focused web sites.

An easy way to obtain a grid is to use nested tables. However, this may obscure the reading order of a page and sabotage the use of assistive technologies. A table-less design allows better source code order, while leaving positioning to the style sheets.

A number of <u>CSS frameworks</u><sup>21</sup> are freely available on the web, giving web designers the option of not starting from scratch on each and every project. We chose to use the <u>EMastic</u> <u>framework</u><sup>22</sup> because it, in contrast to many of the others, is based on relative font sizes. Setting all dimensions in EMs guarantees a scalable design.

Implementation of the design has begun, and the main elements are in place. Adjustments of the typography, styles for the plug-ins and adaptation of DokuWiki functionality and features still remain.

With the new WikiVIKO design we're hoping to meet the requirements for students with disabilities. We have earlier carried out tests for VIKO and for subject VIKO, and will before the site is published carry out usability tests with groups of visually impaired students.

## Conclusion

Accessibility will not be fully implemented in VIKO until later this year. When the standards are implemented all students will have the same opportunity to increase their information literacy, and the library has a tool to use when teaching students with disabilities.

What do we achieve/gain when we migrate from static HTML to the wiki platform? WikiVIKO will be easy to update; one of the strengths of a wiki is that anyone can edit it. The editing will be user-friendly: there is no need to possess HTML or other common webauthoring skills, and DokuWiki provides a history of site revisions, making it possible to reverse any edits. DokuWiki generates standard HTML code which makes it possible to adapt WikiVIKO for use on mobile platforms e.g. iPhone.

In the future we want to use the wiki functionality to interact with the students. WikiVIKO can serve as portal to Web 2.0 tools, with links to relevant blogs, images, videos, and other multimedia resources.

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