ELEARNING CONTENT ACCESSIBILITY
FOR DISABILITY STUDENTS

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Abstract - Internet is the advanced technology which will generate a new era of communication, education, and trading among the people worldwide. For education on internet, eLearning websites is the advance educational tool developed in the twenty-first century which will generate new era of education under the concept of anyone can study at anywhere in anytime. But along with the growing of internet, unfortunately that many people with visual, hearing, mobility, or learning disabilities are unable to take advantage of the opportunities afforded by the internet due to badly designed of web leading to inaccessibility. Therefore, the issue of web accessibility is strictly required to concern by all web operators. Thus, eLearning websites cannot be avoided to this issue in order to fulfill the concept of eLearning that everyone can learn. And, to create accessibility for disability people on eLearning websites, one of important component is web content. This paper as a result was proposed about the way to create content accessibility for disability students on eLearning websites. The paper found that two versions of web content accessibility guidelines were the key helping all eLearning operators to follow for designing their websites to be fully accessed by all group of students under the concept of eLearning which is everyone can study.

Keywords: Content Accessibility, Disability Students, eLearning, Web Accessibility

1. INTRODUCTION

The Internet is the advance technology generating a new era of communication, education, and trading among the people worldwide, and part of the internet technology is the world wide web which is the key on the internet using. According to Burgstahler et al. (1997), the World Wide Web (Web) has rapidly become the most popular Internet resource, combining hypertext and multimedia to provide a huge network of educational, governmental, and commercial resources.

Along with the growing of internet trend regarding to education mode, eLearning is the education channel operated through online internet. ELearning websites is the advance educational tool developed in the twenty-first century which will generate new era of education under the concept of anyone can study at anywhere in anytime. Arrigo (2005), from the middle of 1990s onward, the number of colleges and universities where provided courses and degree programs via eLearning mode has been growing dramatically. And Bose (2003) stated that eLearning was born during the dot-com frenzy, and the term eLearning was not much well known in the beginning, however later it is very common especially in the university community. Sloan-C (2007), eLearning will become a part of everyday life, accessible and affordable for anyone; anywhere; at anytime.

Moreover, Internet-based options promise to make courses available to everyone; everywhere, and it was assumed by most instructors and administrators that anyone with a computer and Internet connection could access various courses offering via eLearning mode (Burgstahler, 2002). Therefore, eLearning education shall be the mode of education available to all people in the society and all persons must enable to access to this mode of
education including people with disability.

Although eLearning shall be the mode of education allowed everyone to access, people with disability still face difficulty to access the eLearning websites as equal as ordinary group of people due to badly web design or lack of understanding among web designers regarding to this group of users. According to Lilly (2001) The Internet and World Wide Web (Web) provide instant access to vast quantities of information. Unfortunately, many people with visual, hearing, mobility, or learning disabilities are unable to take advantage of the opportunities afforded by the Web. This is because badly designed and/or inaccessible Web sites prevent them from fully experiencing the graphical and aural benefits of the medium.

Thus, in order to make eLearning websites are truly accessed by everyone including people with disability, all eLearning websites therefore are required to rely on the issue of web accessibility to facilitate disability people to equally access with ordinary users. According to Prougestaporn (2008), to create eLearning websites fully accessible consists of four components as proposed in web accessibility model for eLearning websites, and one of the component is web content that must be designed for accessibility because content is the key component to convey the information on every website particularly eLearning websites. This paper as a result proposed to present the key to make eLearning content that could be fully accessed by all disability people so that they could view content on eLearning websites as equal as ordinary people by showing the key guidelines with brief explanation to follow.

This paper is first describes the term disability people, eLearning, and web accessibility. Then, the content accessibility on eLearning websites and the guidelines to make content accessibility are discussed. Finally, comparison of content accessibility guidelines and conclusion to use with eLearning websites are stated.

2. PEOPLE WITH DISABILITIES

The definition of disabilities defined by The Americans with Disabilities Act 1990 (ADA) is a person who has a physical or mental impairment that substantially limits one or more major life activities; has a record of such an impairment; or a condition that impairs a major life activity such as walking, hearing, seeing, or working (The American with Disability Act., 1995).

According to Disability and Equality Act. 2010 (2010), disabled person defined as someone with a physical or mental impairment which has a substantial and long-term adverse effect on his ability to carry out normal day-to-day activities. According to Asia Pacific Center Development for Disability (2003), Thailand defined the people with disability as A person with Disabilities means an individual who is limited by function and/or ability to conduct activities in daily living and to participate in society through methods used by persons without disabilities due to visual, hearing, mobility, communication, psychological, emotional, behavioral, intellectual or learning impairment, and has special needs in order to live and participate in society as to others.

3. ELEARNING

According to Sloan-C (2005), the term ‘eLearning’ is the transforming learning delivery where allowing to the reach online source of information which is the solution for individual study and can reduce the pride and stimulate the common coalition. Horton (2001), proposed that eLearning was the use of Internet and digital technologies to create experiences that educate fellow human beings.

By the end of the 1990s, eLearning was predicted to become one of the fastest growing, knowledge-based industries in the developed world and the single most important transforming influence on education and corporate training and development (Sloman, 2001). The term eLearning however was not actually well known several years ago, but currently it is very common especially in the university community(bose, 2003).
4. WEB ACCESSIBILITY WITH ELEARNING WEBSITES

According to Yu (2002), Web accessibility issue has been increasingly becoming an important component of Web design and use. “Web accessibility” means that people with disabilities can use the Web, or specifically explain as Web accessibility means that people with disabilities can perceive; understand; navigate; and interact with the Web, and that they can contribute to the Web (W3C, 2006).

According to Paciello (2000), Web accessibility referred to the practice of making websites usable by people of all abilities and disabilities.

According to W3C (2006), the essential components that interdependently worked to create web accessibility in any websites consists of web content, authoring tools, web browsers, and assistive technology, all must be designed with accessibility so that the websites designed are fully accessed by people with disability people. Prougestaporn (2008) concluded that to create eLearning websites as web accessibility to people with disability also must relied on all these four components which was proposed as web accessibility model for elearning websites.

5. ELEARNING CONTENT ACCESSIBILITY

According to Prougestaporn (2008), one of the component to create accessibility eLearning websites for all learners is to make accessibility content on website for all students to access equally. In order to create accessibility content on eLearning websites, there are the guidelines set to guide web designers to follow, and this paper would investigate the guidelines issued by World Wide Web Consortium or W3C called web content accessibility guidelines to apply for eLearning websites.

This set of web content accessibility guidelines are widely accepted together with considered as international standard, also is the first official systematic outlined set to follow in the world according to Loo, Lu, and Bloor (2003). Moreover, Elges (2003) further noticed that the internationally recognized applicability guideline to design web content to support the accessibility by people with disability is web content accessibility guideline of the W3C which has emerged as an important benchmark in applying uniform web accessibility standards.

6. WEB CONTENT ACCESSIBILITY GUIDELINES

It was most notably that the W3C have developed Web Content Accessibility Guidelines in order to define the elements of web design that extend the level of site accessibility for every people equally including disabled people (Yates, 2005).

The Web Content Accessibility Guidelines (WCAG) is the document explains how to make Web content accessible to people with disabilities. And, Web "content" generally refers to the information in a Web page or Web application includes text; images; forms; sounds; and so on (W3C, 2006).

Clark (2006), Web Content Accessibility Guidelines (WCAG) were part of a series of Web accessibility guidelines published by the W3C's Web Accessibility Initiative, which consist of a set of guidelines on making content accessible, primarily for disabled users, but also for all user agents. In 1999 the Web Accessibility Initiative, a project by the World Wide Web Consortium, published the Web Content Accessibility Guidelines 1.0, which has been widely accepted as the effective guidelines on how to create accessible websites in recent year (Clark, 2003). Then since 2003, the W3C continuously worked on the second edition of these guidelines called web content accessibility guidelines 2.0 (Clark, 2003).

Refer to W3C (2006), Web Content Accessibility Guidelines 1.0 was approved in May 1999 and is the stable and referenceable version. However, WCAG 2.0 is the latest version completely done and published as the newer version of guideline to make web content accessibility among users.
with disability.

6.1 WEB CONTENT ACCESSIBILITY GUIDELINES 1.0

Web Content Accessibility Guideline 1.0 is the first official version of accessibility guideline and being continuously used as the reference guidelines to create content accessibility for all users. According to W3C (2005), web content accessibility guidelines (WCAG) 1.0 was approved in May 1999 and is the stable and reference able version.

The guidelines mainly discuss on accessibility issues and provide accessible design solutions based on problems occurred for users with certain disabilities, which will support those unfamiliar with accessibility issues pertaining to Web page design due to that many users especially disability users may be operating in very different context from ordinary users (World W3C, 2006).

The guideline focus mainly on the way to increase accessibility level among disability people without suggesting to avoid using content that majority people can view but providing new assistance tool in stead to support, for example: to provide text equivalent to explain images for visually-impaired users or provide image language to explain video presentation for hearing-impaired users (W3C, 2006).

Web Content Accessibility Guideline (WCAG) 1.0 contained 14 guidelines which are shown together with brief explanation under context of eLearning websites as follows:

Guideline 1: Provide equivalent alternatives to auditory and visual content. Elearning websites must provide text description for image or graphic illustrated as part of learning content so that visually-impaired students could interpret what the image or graphic conveyed. Meanwhile, it must provide sign language for audio or video presentation on the learning content as well in order to assist hearing-impairment students to understand the content.

Guideline 2: Don't rely on color alone. Elearning websites must provide clear different color of background and text such as background has blue color, the text provided must be in white color so that it could assist students with low-vision blindness to clearly read the text. It also must provide symbol to mark any text used color to differentiate, for example in examination: the question need to ask meaning of one word by marking as red color of that word, it is required to show the symbol in front or top of that word in order to assist color blindness students.

Guideline 3: Use markup and style sheets and do so properly. Use document mark up presentation. Provide clear explanation for table, chart or graphic in case users cannot interpret table style (e.g., using a table for layout or a header to change the font size) makes it difficult for users with specialized software to understand the organization of the page or to navigate through it.

Guideline 4: Clarify natural language usage. Elearning websites must provide pronunciation link or button in case there are multiple languages in one document for example: provide wording in Thai language with original English word, it is required to provide button click to listen the pronunciation of English language also. Thus, it will assist visually-impaired students who use screen reader which some version could not support multiple languages reading. It also must provide expansion on all abbreviations and acronyms so that it could easier to interpret.

Guideline 5: Create tables that transform gracefully. Elearning websites must use table only to convey data or statistic and avoid using table to layout page of the learning content so that visually-impaired students could interpret information clearly as well as ordinary students will not get any confusion to read the content. However, eLearning websites enable to use table to show data or statistic because students can interpret easily, but it must provide the description before presenting the table in terms of how many rows, how many columns, what kind of data shown in each column.

Guideline 6: Ensure that pages featuring new technologies transform gracefully.
Elearning websites must ensure the content page could be used with older browsers, do not limit to only advance browsers to use because it must realized that everyone do not have equal ability or skill or time to keep updating new version of browsers from time to time, and theme of eLearning is everyone can learn, so it must makes content page to facilitate everyone. However, in case the content page designed to support with advance browsers version, it is required to provide button for user to select in case they use older version of browsers to view the content. It would assist visually-impaired students who use screen readers and some versions of screen readers could not work well with newer version of browsers.

Guideline 7: Ensure user control of time-sensitive content changes. Elearning websites must provide appropriate time length to view each content particularly during the examination test, it must provide appropriate time for students especially visually-impaired students to read because they could not read all things in once due to they must rely on screen reader to read. It must avoid too quick automatic refresh or too short period to view page before page working offline automatically, for example: it should provide at least one minute or two minute.

Guideline 8: Ensure direct accessibility of embedded user interfaces. Elearning content must provide content page to support with special devise such as screen reader or sign language section, for example: it case the page is PDF version, it should also provide html version to assist visually-impaired students as some screen reader versions do not support with PDF by providing links or button to select either html or pdf. Meanwhile in case for video presentation page, it must provide sign language section to hearing-impairment to view.

Guideline 9: Design for device- independence. All content pages in eLearning websites must assist users to function independently by themselves such as use keyboard, and avoid designing page that enable to function by only mous clicking, but in stead must provide alternative way such as press button through keyboard, so that visually-impaired students who mainly function everything through keyboard could access easily. In addition, it also must shows the symbol to guide hearing impairment students to follow in case video presentation is used for explaining in stead of text.

Guideline 10: Use interim solutions. Elearning content must provide substitution page to support user with older version of browsers or assistive technology such as some screen reader versions could not work well with newer browsers or some students who face difficulty to update newer browsers versions. It must provide alternative button or link for users to select to view content in case they do not use the browsers or assistive technology that support the content page provided.

Guideline 11: Provide context and orientation information. ELearning content must provide context and orientation information to help users understand complex pages or elements, for example: in long content page, it is required to provided page content on the top of the page to assist students to skipt or select content they need to view quickly, also provide navigation tools to assist students move around the page. In addition, it also must grouping elements and providing contextual information about the relationships between elements so that all students could fully understand whole content presented.

Guideline 12: Provide clear navigation mechanisms. Elearning content must provide clear navigation to show main content of the page so that students particularly visually-impaired students or hearing impairment students could move around quickly. In addition, it is required to provide site map button to assist users to quickly find what they need.

Guideline 13: Ensure that documents are clear and simple. All contents on eLearning must use correct spelling, grammar and convey in the form that all students could interpret equally. In case, there are graphic, image, or video used as the part of content to help
students easily understand, text description and sign language are required to provide for assisting visually-impaired students and hearing impairment students.

In addition to those 13 guidelines, there is one guideline which is guideline 12 that guide students to rely on W3C recommendation, which means that to suggest eLearning website’s designers to follow all guidelines to create accessibility eLearning content.

6.2 WEB CONTENT ACCESSIBILITY GUIDELINES 2.0

Web Content Accessibility Guideline 2.0 is the new version of accessibility guideline projected since 2003. According to Slatin (2005), web content accessibility guidelines 2.0 covered a wide range of issues and recommendations for making Web content more accessible, also it was defined and explained the requirements for making Web-based information and applications accessible to a wide range of people with disabilities.

In addition, the guidelines is more emerged as a standard relying on existing laws and policies related to information and communication technology as well as to focus on importance of all members of society equally including people with disabilities in order to be able to access this information medium more effectively (W3C, 2006).

Web content accessibility guidelines 2.0 itself actually is designed as a technical standard rather and most people will use the supporting materials when developing Web content and Web tools, instead of the actual technical standards document so that they can design the web content following the guideline set (W3C, 2006).

Web Content Accessibility Guideline (WCAG) 2.0 divided into 4 main principles and categorized into 12 sub-guidelines, which are shown together with brief explanation compared to web content accessibility guidelines 1.0 under the context of eLearning websites as follows:

Principle 1: Perceivable - Information and user interface components must be presentable to users in ways they can perceive. ELearning contents must be presented in the way all students could perceive equally. This principle consists of four main guidelines:

- Guideline 1.1: Text Alternatives: Provide text alternatives for any non-text content so that it can be changed into other forms people need, such as large print, Braille, speech, symbols or simpler language. This guideline relevant with guideline 1, guideline 6, guideline 9, and guideline 12 of Web content accessibility guidelines 1.0.

- Guideline 1.2: Time-based Media: Provide alternatives for time-based media. It consists of 1) Prerecorded Audio-only: An alternative for time-based media is provided that presents equivalent information for prerecorded audio-only content. 2) Prerecorded Video-only: Either an alternative for time-based media or an audio track is provided that presents equivalent information for prerecorded video-only content. And, 3) Use description, sign language. This guideline relevant with guideline 1 of Web content accessibility guidelines 1.0.

- Guideline 1.3: Adaptable: Create content that can be presented in different ways (for example simpler layout) without losing information or structure. This guideline is composed by applying guideline 2, guideline 3, guideline 5, guideline 6, and guideline 12 of Web content accessibility guidelines 1.0 as a fundamental key.

- Guideline 1.4: Distinguishable: Make it easier for users to see and hear content including separating foreground from background simply by different colors. Separate clearly between text and image. Audio And for Control: If any audio on a Web page plays automatically for more than 3 seconds, either a mechanism is available to pause or stop the audio, or a mechanism is available to control audio volume independently from the overall system volume level. This guideline is composed based on guideline 2 of Web content accessibility guidelines 1.0.

Principle 2: Operable - User interface
components and navigation must be operable. ELearning content must be designed for all students could operate through the web page by themselves independently. This principle consists of four main guidelines:

-Guideline 2.1: Keyboard Accessible: Make all functionality available from a keyboard. This guideline relevant to guideline 6, and guideline 9 of web content accessibility guidelines 1.0.

-Guideline 2.2: Enough Time: Provide users enough time to read and use content. This guideline relied on guideline 7 of Web content accessibility guidelines 1.0.

-Guideline 2.3: Seizures: Do not design content in a way that is known to cause seizures. E.G. webpages do not contain anything that flashes more than three times in any one second period. This guideline is additionally composed based on Guideline 7 of Web content accessibility guidelines 1.0.

-Guideline 2.4: Navigable: Provide ways to help users navigate, find content, and determine where they are. This guideline is composed by using guideline 3, guideline 5, guideline 9, guideline 10, guideline 12, and guideline 13 of Web content accessibility guidelines 1.0 as the key fundational step.

Principle 3: Understandable - Information and the operation of user interface must be understandable. ELearning content must be designed for all students to understand equally without facing any limitation. This principle consists of three guidelines:

-Guideline 3.1: Readable: Make text content readable and understandable with correct spelling, grammatical used and appropriate wording. This guideline is composed by relying on guideline 4, guideline 5, guideline 13, and guideline 14 of Web content accessibility guidelines 1.0 as key fundamental data.

-Guideline 3.2: Predictable: Make Web pages appear and operate in predictable ways. For Navigation: Navigational mechanisms that are repeated on multiple pages within a set of pages occur in the same relative order each time they are repeated, unless a change is initiated by the user. For Consistent Identification: Components that have the same functionality within a set of pages are identified consistently. This guideline is composed based on Guideline 7, guideline 10, guideline 13, and guideline 14 of Web content accessibility guidelines 1.0.

-Guideline 3.3: Input Assistance: Help users avoid and correct mistakes. For Error Identification: If an input error is automatically detected, the item that is in error is identified and the error is described to the user in text. For Labels or Instructions: Labels or instructions are provided when content requires user input. And for Error Suggestion: If an input error is automatically detected and suggestions for correction are known, then the suggestions are provided to the user, unless it would jeopardize the security or purpose of the content. This guideline relevant to guideline 13 of Web content accessibility guidelines 1.0.

Principle 4: Robust - Content must be robust enough that it can be interpreted reliably by a wide variety of user agents, including assistive technologies. ELearning contents must be designed to be reliable for all students as well as all students enable to interpret the content including students who use assistive technology such as screen readers or students who required additional source like sign language. This principle consists of one single guideline:

-Guideline 4.1: Compatible: Maximize compatibility with current and future user agents, including assistive technologies like Screen reader, Braille display. This guideline is composed based on Guideline 3, and guideline 5 of Web content accessibility guidelines 1.0.

7. COMPARISON OF WEB ACCESSIBILITY GUIDELINES

Web Content Accessibility Guideline 1.0
and 2.0 are similar in fact that both guideline versions are widely known as the international standard guideline for web content developers. Both of them are compared each other as well. According to W3C (2005), Web content accessibility guidelines 1.0 was published as a Recommendation guideline in May 1999, and version 2.0 developed based on version 1.0 which have the same aim to guide how to make Web content accessible to people with disabilities and to define target levels of accessibility by incorporating feedback on WCAG 1.0.

Web content accessibility guidelines 1.0 meanwhile has provided a vital international standard, web content accessibility guidelines 2.0 however is urgently required to address current/future technologies and situations in order to maintain as international standard (Henry,2007).

Since the release of Web content accessibility guidelines 1.0 in May 1999, the W3C Working Group has received feedback on priorities of checkpoints; the usability of the set of documents; and requests for clarifications on the meaning of specific checkpoints and what is required to satisfy them. As a result, the aim of web content accessibility guidelines 2.0 be more efficiently organized, adjust the priority of some checkpoints, modify; remove; and add requirements due to changes in Web technologies (W3C, 2006).

The table below represents the comparison of guidelines context between Web content accessibility guidelines 1.0 and 2.0:

### 8. CONCLUSION

From the study reviewed, this paper concludes that to design content presented in eLearning websites that are enabled to access by every people equally, web content accessibility guidelines are the effective guidelines web designers should rely on to follow in order to generate accessibility content for all groups of people especially disability students to access eLearning websites, because those guidelines are the key guidance to assist web designers to generate accessibility content on eLearning websites for disability students.

And, all web designers could ensure that while they strictly follow the guidelines, their designed websites still be effectively accessed by ordinary students without facing any difficulty. Due to the fact that the main aim of the guidelines is to design content presented on website that disability people enable to access while ordinary students also enable to access without facing any difficulty caused by the guidelines.

In addition, the theme of guidelines is to convey under technical concept how to design and convey content effectively accessed by disability students without mentioning about content detail, so eLearning operators could ensure that to rely on these guidelines will not cause the changing of learning content.

Both versions of web content accessibility guidelines 1.0 and 2.0 are either able to rely on. Even though the web content accessibility guidelines 2.0 is the newer version and it is the modification version from 1.0, but the main guidelines in both versions still share the same content, so it is still useful to rely either 1.0 or 2.0 version.

### 9. FURTHER STUDIES

As this study has reviewed the guidelines assist to create accessibility of eLearning content for disability students, further studies could be proceeded in the future are to design content lessons on eLearning websites by relying on all guidelines of web content accessibility proposed in this study, then conduct the field research by simulating the cost content and let disability students to study in the specific time period for example 3 months cost, and test the learning effective of students to measure whether the content designed for accessibility is effective to assist disability students’ learning or not.

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