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## Chapter XVIII

# Development and Evaluation of a New HTML Browser Method of Presenting Reading Material for Students with Low Vision

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### ABSTRACT

*Students with low vision or partial sight have a variety of vision needs and their needs are very different from student to student. Provision of suitable reading materials is still a difficult task. What we describe here is a novel method combining web-related technology and recent advancement in vision science. With reading tests by the MNREAD-J reading chart, we obtained parameters defining each student's vision needs. A newly developed software package called the HTML viewer generated a CSS layout data for each student according to the parameters. With this individually adjusted CSS, any web browser displays HTML documents in appropriate way for each student. Textbooks were prepared in HTML format and used with the HTML viewer. Evaluation in real classroom setting showed students were able to use this new method of reading efficiently without a prior knowledge of PC operation.*

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## INTRODUCTION

There is a considerable variety in vision needs of students with low vision. Low vision is defined as vision status where daily living activities such as reading newspapers are difficult even after eye correction is made with spectacles (Faye, 1984). Usually, magnification of print greatly reduces the reading difficulty, but the appropriate print size differs depending on individual's vision needs; for example, one student needs 18 point print whereas the other requires much larger 28 point letters. The variation of vision needs is not confined to the size dimension. For a certain type of low vision, contrast reversal benefits reading, in other words, white text on dark background is more legible than the opposite and usual one (Legge et al., 1986). And, some other type prefers limited field of view for ease of navigation through pages. There are several alternatives in methods of providing reading materials to these students: (1) large print textbooks provided by the government, (2) enlarged copy by Xerox machines, (3) large print materials handwritten by volunteers, (4) normal print with optical reading aids or magnifiers (Zimmerman, 1996), (5) normal print with electronic reading aids such as closed circuit television systems (CCTV). Each method has its advantage and disadvantage, and recent methods are more flexible and adjustable to wider range of needs in general. For example, CCTVs were introduced in 1970s (Goodrich & Sacco, 1996) and are usually capable of changing the magnification power and reversing contrast polarity of text and background. Some models of CCTV show a slit on the screen through which only single text line is displayed at a time in order to make reading easier for persons with a certain type of low vision. Consequently, CCTV "is of particular importance, since it is the only device currently available that can provide variable magnification, good field of view, and variable contrast" (Goodrich & Bailey, 2000).

Not much mentioned in the literature, but simple personal computers (PCs) have introduced very flexible alternatives, such as e-books and web browsers. Although these browsers are not designed specially for the use of users with low vision, they can be very useful. Once reading materials are prepared in PDF or HTML format, which is not very difficult with off-the-shelf software packages, PCs turn into versatile reading aids. Firstly, ordinary web browsers, which one can obtain online free of charge, have a built-in capability to adjust to users' special vision needs, that is, variable text size and adjustable color combination of text and background. Secondly, words wrap around to fit in the web browser window and one does not have to navigate the text horizontally, even with very large text size. This feature makes it much easier to browse enlarged text with web browsers than with the other computerized method. A recent computerized CCTV system scans the printed text and shows optically recognized text on the monitor in the same word-wrap mode (Rosenthal & Williams, 2000). But, wrap-round mode is universal in web browsers and one does not have to have a specialized CCTV for it. Thirdly, hypertext features greatly reduce the burden which persons with low vision experience in navigating through pages. In summary, the computerized alternatives, especially web browsers, have strong advantages in tailoring reading materials for students with a wide range and different types of vision needs.

Even if there are powerful and flexible reading aids, they are useless until they are appropriately adjusted to individual's vision needs. Recent progress in vision science revealed that objective reading measurement is effective in determination of vision needs quantitatively and in predicting the types of reading aids for individuals (Ahn & Legge,

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