Methods and Techniques for the Access of Persons With Visual Impairments to Handbooks and Textbooks

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The transformation of learning materials in an accessible format for blind students allows them to access texts and graphics. This access was not possible before considering the past technologies. The Daisy format represents an accessibility standard that permits the visually impaired person to listen an audio book as a person without disability. In this way, the visually impaired person can listen the audio book according to its content and/or pages. The usage of this format enables to develop new approaches in the process of teaching and learning, not only for visually impaired students but also for visually impaired teachers. The Daisy format proved to be efficient in the educational area also for children with learning difficulties. Studies concerned with efficiency of Daisy book.
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Education in the context of information technology

In the context in which the students with visual impairments, supported by Information Technology (IT) have the opportunity to attend the mainstream schools, the accessibility of the teaching aids does not refer only to the translation of books in an electronic or printed format, but also to their transposition in an audio accessible format. The introduction of the IT for persons with visual impairments was a very important step in the establishment of some new strategies, at the level of the person with visual impairments and also concerning the approach of the modern educational and professional theories. The possibility of reading an electronic text with a screen reader represents an efficient way of having access to some kind of information.

In the beginning of IT, the main form of information for persons with visual impairments was the printed book and the audio recordings, but nowadays the electronic format became more and more accessible. This one allowed an easier and faster structure for the material, offering the possibility to have an access almost anytime and anywhere. Any printed material is, of course in the beginning in an electronic format. The transposition of the electronic format in a printed one is not useful to the visual impaired readers because

they don't have any access to the information. If we consider the learning style of a person without impairments, according to the **V** model (visual) **A** (auditive) **R** (reading/writing) **K** (kinestesic) of the learning styles, proposed by Fleming and Milles [1], we can say that the dominant style is the visual one, followed by the auditive, the reading/writing and the kinestesic one. In the case of visual impaired persons, the auditive and kinestesic styles are the main ones. IT stimulates both styles involved in learning: auditive (the information is auditively offered by a screen reader) and kinestesic (the information is transposed in Braille format), both styles having a direct influence on the reading and the writing style. So, in order to learn more efficiently and to have a quicker access to information, the electronic format is the most suitable for the visual impaired.

Generally, some texts in special fields are not permanently accessible. We are different persons and we have also different ideas concerning science. The information in accessible electronic or printed format is not available in all the fields of education, but we can find a lot of it on the internet, in online data basis, online publications and also in the libraries. However, there are educational fields in which there is an inaccessible part. The inaccessibility of a material for a visually impaired student consists in his impossibility of

reading it and if the publishing house does not offer alternative formats (audio or printed with larger fonts), the visually impaired is in the situation of using different ways of accessibility of the printed content and of requesting some help from a normal sighted person or one with low vision to enable his access or to describe the figures or the drawings.

There are several methods of accessibility of the information for visually impaired persons. Mainly, for persons with low vision, taking into account the specificity of the impairment, the teaching aid has to be transposed in enlarged format or build so that the colors create a contrast and are not unpleasant for the eye. Another form of accessibility would consist in using some *screen larger* programs on the computer. For visually impaired students, it should be done according to each one's favorite information reading style. Certainly, there are persons who prefer Braille reading, as well an audition on CD or on the computer with a screen reader. Compared with the electronic format, the audio one has a major disadvantage, it doesn't bear changes or annotations, „book mark" type, but it is flexible because it allows reading a book on a mobile support, mp3-player or mobile phone.

1. Daisy books

DAISY comes from Digital Accessible Information System.

DAISY Consortium [2] was founded in May 1996 by several libraries which borrowed audio books, in order to coordinate the international transition from the analogue audio book to the digital one. The consortium's members are actively promoting the DAISY standard for the creation of audio digital books, this imposes a new reading style to the visually impaired and the learning disabled persons. More precisely, the consortium idea is that all the printed information should be accessible to persons with learning disabilities, as soon as they are published, without additional costs, in an accessible format, having a similar structure and the same possibilities of text selective reading.

The first DAISY standard was patented in

Sweden in 1994. The initial idea was the one of using digital audio recordings and the introduction of a document structure, which allows the reader a flexible reading. In its short history, DAISY specification had a great evolution. They already offer a more flexible and more pleasant reading for visually impaired persons or with learning disabilities, specially for the ones with reading disabilities.

Beginning with 1997, DAISY consortium decided to adopt an open standard based on the files developed on the Internet format. DAISY 2.0 specifications were created in 1998 and the 2.02 recommendations were approved in February 2001.

DAISY standard 3, ANSI/NISO Z39.86 2002 became official in March 2002. This last standard was realized with the support of DAISY Consortium, the National Library Service for the Blind and Physically Handicapped (which is part of the Congress Library of the U.S.A.), to whom some other organizations form North America were attached.

A DAISY book [3] is a reliable reproduction of the content of a printed material, for example a novel, a dictionary or a magazine in a digital format accessible to persons with visual impairments and reading disabilities. Daisy format consists in a files collection, printed on one or more CDs. The books are distributed on CDs or in an electronic format, by Internet.

A Daisy book can be listened to in a selective way, in the same way like a printed book. By using a similar equipment to a CD-player or computer vocal synthesis with a special soft, the reader can jump to one page, can chose from the content a certain chapter, can pass from a paragraph to the other, can repeat a sentence, can exclude the foot notes.

If the electronic text which reproduces the printed book's content is also included, DAISY format offers searching and synchronizing the printed and the spoken text facilities.

Each Daisy book begins with the title and the author of the printed book that it reproduces, followed by a standard header. At the end of this header some information is offered about

the book's structure, number of pages, of chapters, subchapters, foreword, back cover etc.

The use of Daisy format [4] will play an important role in the accessibility of mathematic books, of manuals and of university courses for visually impaired. When you are supposed to write an essay, a graduation paper or a scientific study, you have to include in the text the exact references of the used quotations. A standard reference presents the book, the author, the edition or year of appearance, the chapter and the page where stands the quoted text. Daisy offers this possibility because, as we said before, it reproduces exactly the printed book's content, including all these information for future references.

Another example would be the efficient use of manuals by students and teachers. A teacher could say to his students: "For tomorrow you have to learn lessons from page 32 to page 44 and the exercises 2, 4 and 6 from page 45". If the student is visually impaired he will know exactly where to go if the manual is in a Daisy format.

By its influence, Daisy Consortium convinced Microsoft Company to include the Daisy format among the standard ones in which the documents recognized by its most popular applications can be converted. So, any Microsoft document, Word, Excel or E-book will be easily converted in Daisy format, leading to new titles accessible to visually impaired persons.

2. Daisy equipments

Victor Reader Classic was projected for the reading of bestseller books, novels, magazines, etc.

This equipment (figure 1 and figure 2) [5] allows an easy way though the book's structure and a quick position on the beginning of the searched section. By its available functions, it is able to consult the book's content, can go from a section to another directly or to come back to some book mark.

The Compact model (figure 3) [5] – is a device for blind or low sighted users who has to go to the university, are employed in jobs

which requires frequent moving. All the control buttons have tactile indications and are easy to use, the only visual indication is a little bulb which allows the low sighted person to know when the device is working and if it is in the charging time. All the operations are audio indicated.

Fig.1. DAISY Victor Reader – Classic X

Fig.2. DAISY Victor Reader – Classic X+

Fig.3. Victor model, compact version

Concerning the sizes, this device can be held in the person's palm. On its anterior side it has keyboard similar to a phone, with 12 buttons. Button number 5 has an indicator like a pen, for rapid orientation. Above button 1 is another square button which indicates: *Go To page,* being considered a sort of header of the device and above button 3 there is a button like a rhombus which is a *Bookmark key*. In the superior part there is the loudspeaker and the internal microphone. In the posterior part of the keyboard there is limit line under which there are four buttons. The three bottom buttons are: *Rewind, Play/Stop* and *Forward*. The fourth one is a *sleep timer* which offers to the user the possibility of shutting

down the device automatically in a certain time. On the left side, in the exterior, there is a round button for the *Power* and two like arrows, representing the control buttons for the volume, speed and tone. On the right side there are the headphones coupling and external microphone, as well as the recording button.

3. Daisy research in education
Most of the studies with the purpose of determining the impact of using DAISY books in education at the primary and secondary level took place in schools from Sweden and Norway [6].

Qualitative studies were performed by Zlatintsi and Eklund [7], studies in which they used care the gathering data method, the observation method and the interview. They compared the way in which the teachers and the students are using a DAISY book and a classical printed one, with the same content. With the questions within the research, they analyzed: the way in which the product is used or not, the possible problems, the using of Ease Reader (the computerized way of the books program in the DAISY format) and their utility. They had problems connected with the reliability coefficient which showed an unsure basis for the general conclusions: out of the 21 schools which used the material, only 4 schools – 11 teachers – answered the questions and the tests as the interviews involved 5 12 years old students from the same classroom. Two of the students had writing and reading disabilities and one of them had concentration problems.

The Bredtvet Centre of Competence [8] realized a study in Norway, with similar purposes: testing the way in which the books in DAISY format are used by students with mild and/or severe reading/writing disabilities. Seven students from the VI grade to the X grade form were evaluated for 5 months. 6 parents and 5 teachers also offered information about the efficiency of using DAISY books.

In the same time, Hilden [9] made some observations and interviews during 3 months on 32 cases of Swedish children between 9 and 13 years old. The purpose was to analyze the needs of the students who do not use the printed books, but audio and digital ones. This study is the widest, but pedagogically speaking is focused on the aspects concerning the reading methods and it is not very interested in the essential questions of the research.

Lundeland [10] continued Hilden's research and on the basis of the former observations, focused on the details which are similar with the one of the other study, for instance: using Daisy, technical details, different types of books, the motivation and the specialization of the users. He realized 6 interviews with students from four secondary schools and with 5 of their teachers. One of the limits of Lundeland's study [10], encountered also in Bredtvet and Eklund's study, consists in the fact that the results couldn't be generalized. It also uses only one instrument of collecting data, leading to a decrease of the reliability coefficient [6].

In 2006, NLB (Norwegian Library of Talking Books and Braille) collected data about the synthetic voice attached to DAISY. Tollefsen [11] realized an informal online research about DAISY. This study included 77 persons, among them 63 were visually impaired, most of them adults. To conclude, we want to make a short review of the main results obtained in the previous research.

DAISY is useful and advised to all the users categories: teachers, students, parents –the audio support stimulates and increases the level of reading. The students felt encouraged, supported, motivated and finally, they required more DAISY books. The opinions are different according to the attitudes, the technical experience, the practice difficulties, but generally speaking, they are positive [6][8].

Bredtvet's research concluded also the fact that the students are strongly motivated by using DAISY and its eventual exclusion from the educational process could have a negative effect on the study. He mentions also that the parents and/or the teachers have a great part in encouraging students in the first steps.

Most of the students prefer the whole text variety and the natural voice one more that the one with the synthetic voice. The natural voice make the production much more expressive, but there still are continue debates between the qualitative and the quantitative aspects.

Another conclusion of Lundeland's study [10], is connected to the fact that the persons with dyslexia and with learning disabilities would rather read the DAISY format books on the computer than on the mobile devices.

Tollefsen's results indicate that the DAISY users are mainly persons who don't have access to classic printed materials and therefore they develop an option for DAISY books. In the same time, this study stresses out the small amount of research concerning the use of printed black / braille format and DAISY format by visually impaired persons.

The conclusions of the mentioned studies are about the lack of information held by students, teachers and parents concerning the use of DAISY. The problems encountered by these categories regarding the learning methods and the teaching aids were also mentioned.

All the studies emphasize the need of a greater knowledge for the teaching staff concerning DAISY format, including data about the technical aspects in this field.

Teachers believe that DAISY is not suitable to the teaching/learning style. And, of course, a lot of the students are avoiding its use in the classroom because of the fear of being „different". That is why, they use DAISY at home or in school, but not in the teaching time.

Hauge [12] in [6] proposes the use of identical covers with the printed books and a further attachment of a CD with the DAISY variety inside each printed book, in order to decrease the discrimination feeling.

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